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The Roentgenologic Aspect of Pulmonary Metastasis

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IN 1916 Moore and I published a paper concerning pulmonary metastatic malignancy based on the study of seventy-one cases. Since then our material has been increased by 196 additional cases, and I have reviewed these in order to determine whether the amplified statistics sustain our original conclusions and whether any additional facts of interest could be elicited.

Without going into tiresome details it may be said that the enlarged series tends to confirm our former conclusions, that (1) pulmonary metastatic malignancy may occur regardless of the seat of the primary focus, (2) it bears no relationship to the extent or duration of the primary disease, (3) it can be discovered in many instances only by the roentgen examination, and (4) the character of the primary growth cannot be predicted from the roentgenogram.

McCallum has cited Virchow's dictum that in those organs in which tumors are commonly primary, metastasis seldom occurs, while primary growths are rare in situations which seem to form the best soil for secondary growths. This principle is particularly applicable to the liver, but applies also to the lungs, in which primary malignancy is quite infrequent and secondary malignancy relatively common. Among recent contributions to the subject have been those of Pfahler, Holt and Ratterman, Weil, and Funk. Pfahler, in 216 cases of pulmonary malignancy, found metastatic carcinoma in 196 and metastatic sarcoma in eleven. Of the 196 cases of metastatic carcinoma there were 150 of mediastinal and hilus involvement, twelve were pleural, thirty-four were of the nodular type, and ten of the miliary type. Holt and Ratterman reported a case of metastatic sarcoma, nodular type, proved by necropsy. Weil's case of miliary metastasis, proved at necropsy, was roentgenologically diagnosed miliary tuberculosis. Three of Funk's cases were secondary; two were carcinoma, and one sarcoma.

Table 1 shows the location and character of the primary lesion with pulmonary metastasis in cases observed at the Mayo Clinic during the last five years. Only cases that can be regarded strictly pulmonary have been included in this series; cases of obviously pleural metastasis and of mediastinal metastasis with apparent projection into the pulmonary hilus have purposely been omitted.

TABLE 1.

Primary Focus.

Breast	37
Kidney	18
Thyroid	17
Lower extremities	17
Upper extremities	12
Testicle	10
Abdomen	9
Stomach	7
Colon	7
Not found	7
Neck	6
Mediastinum	5
Biliary tract	4
Rectum	4
Pelvis	4
Esophagus	3
Chest wall	3

Foot, bladder, prostate, larynx, anal region, back, and lung* each two. Lip, tongue, eye, parotid, brain, jaw, ovary, uterus, vulva, and buttock, each one.

*Metastatic to the other lung.

Character of Primary Tumor.

Carcinoma	114
Sarcoma	44
Hypernephroma	15
Not stated	10
Lymphosarcoma	5
Teratoma	3
Epithelioma	3
Glioma	1
Endothelioma	1

That the clinical manifestations of pulmonary metastasis are very indefinite is strikingly verified by these cases. In 60 per cent respiratory symptoms were either absent, insufficient to justify mention, or of trivial import. With few exceptions, when pulmonary symptoms were present they were not in proportion to the extent of metastatic invasion. Metastasis from malignancy of the thyroid was, of course, among the chief exceptions. Cough was the most common symptom noted. It was usually dry and hacking, and at first unproductive, although in the later stages in some instances there was a frothy, mucoid, or mucopurulent sputum. Hemoptysis was noted in only a very few cases, pain was not a common symptom in uncomplicated cases, elevation of temperature was rare, and none of the patients gave a history of night sweats. There was also a relative paucity of physical signs unless pleural effusion was present. Save for anemic pallor the general physical appearance of these patients was good, and loss of weight, unless the nutritive functions were implicated, was not a constant and notable feature. Eight had gained in weight, and twenty-five had lost less than 10 pounds. Ninety-five patients had an average weight loss of 22 pounds.

This recapitulation corroborates the view previously expressed that the clinical picture of metastasis in the lungs is inadequate for diagnosis in the majority of cases. Without regard to the location of the primary lesion a roentgen examination of the lungs should always be made,

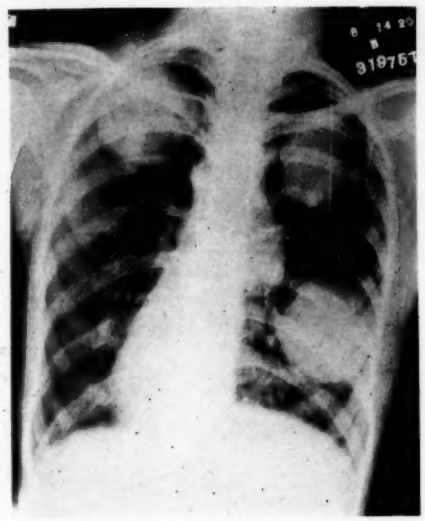

Fig. 1—(319757)—Nodular type of metastasis.

particularly in those cases in which operative removal of the primary growth is intended.

Most text books of pathology describe metastatic growths as nodular only. However, roentgenologic experience has demonstrated that there are three types, nodular, miliary, and infiltrative. Dr. H. E. Robertson, professor of pathology in the University of Minnesota, states that our roentgen classification and is also justified from a pathologic standpoint With high pulmonary resistance and low virulence of the cancer the nodules are relatively large but few in number; under contrary conditions the lesions are relatively small and the number is vastly increased. The difference is visible roentgenologically antemortem and macroscopically postmortem.

The nodular type of metastasis which is by far the most common, is ordinarily marked by round, dense, homogenous areas varying from 0.5 cm. to 6 cm. or 7 cm. in diameter. The borders of the nodules are usually sharply circumscribed, without the hazy zone characteristic of an inflammatory process. Nodules are most often multiple, involving the middle and lower lobes, the apices being quite clear (Fig. 1). While they may be large, it is unusual for them to attain great size without the appearance of other areas; this is a valuable point in distinguishing them from benign lesions. They usually invade both lungs and their multiplicity is also a distinguishing feature. In the cases in this series, when one lung only was affected, the right was involved

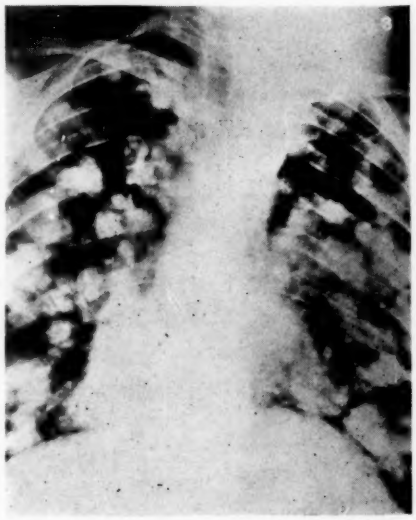

Fig. 2—(149223)—Metastasis nodules with feathery irregular borders.

three times as often as the left. While most nodules are circumscribed, they may rarely have a feathery or irregular outline due to the lessened resistance of the lung tissue and the greater virulence of the cancer. Microscopically, the periphery of this type of nodule presents an irregular appearance similar to the infiltrating borders of a primary growth (Fig. 2). Aside from the foregoing exceptions, the distinctive characteristics of the nodular type are the large size, the sharply outlined borders, the multiplicity of nodules, and the involvement of both lungs.

The miliary type of metastasis is marked by a shower of innumerable, round or slightly irregular, small, discrete areas of increased density, varying in size from 4 mm. or 5 mm. to 1 cm., depending on the stage of development. While they are mostly discrete, the overlapping of their shadows may cause a conglomerate appearance. However, it must be borne in mind that the areas grow by peripheral extension and that their confluency is merely accidental. The borders of the individual masses appear to be vaguely delimited from the surrounding parenchyma of the lungs, but stereoscopic examination shows that this appearance is due to the superimposed shadows of the numerous areas. The lesions are often fairly uniformly distributed throughout the lung fields, although in many of our cases the middle and lower lobes were more extensively involved (Fig. 3).

The infiltrative type has been described by roentgenologists who have observed it as an infiltration extending from the hilus along the bronchial markings. No instances of this type were noted

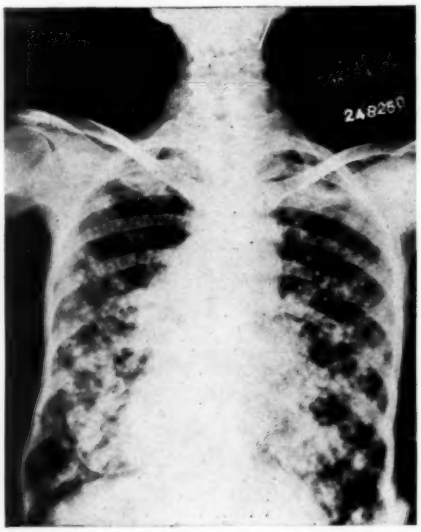

Fig. 3—(248250)—Miliary types of metastasis.

in our series. From the description given it would require careful differentiation from metastasis to the mediastinal glands, primary carcinoma originating in the bronchus or mediastinum, pleural metastasis, Hodgkin's disease, syphilis, and various other hilar and mediastinal processes. Pathologists familiar with postmortem study whom I have consulted state that my failure to observe any instance is easy to

understand as the type is exceedingly rare.

Typical cases of either the nodular or miliary type are so striking that they require no elaborate differentiation from other pulmonary lesions. Early and atypical cases may, however, necessitate careful consideration as differential points cannot be described with precision.

Malignant metastasis confined to the pleura without effusion may give a roentgenologic picture so much like that of metastasis in the parenchyma of the lung that it cannot always be distinguished even by the scrutiny of stereoscopic plates. When fluid is present the pleura is usually thickened, and the whole picture is obscure.

Lesions which, in varying degree, simulate the nodular type of metastasis include cysts, abscesses, interlobar effusions, Hodgkin's disease, calcium metastasis, and syphilis.

Hydatid, or echinococcus cysts are nearly always single and occur most often in the right lower lobe, being secondary to cysts of the liver and gaining entrance through the diaphragm. An unruptured cyst presents a dense, round, sharply outlined shadow. After rupture and partial drainage, it may resemble a ring with a translucent center or a cavity partly filled with fluid.

Practically all of our cases of pulmonary abscess show the hazy border characteristic of inflammatory processes and are irregular in shape. In one of our cases of abscess of the lung, confirmed at necrospy, the roentgenogram revealed a single dense area, irregular in outline and so large that the absence of other densities practically excluded malignant metastasis if the existence of the latter was considered at all.

Often interlobar effusions have a wedge-like form with one or more curved borders. An instance of interlobar effusion displayed a well rounded opacity between the right middle and lower lobes (Fig. 4). There were

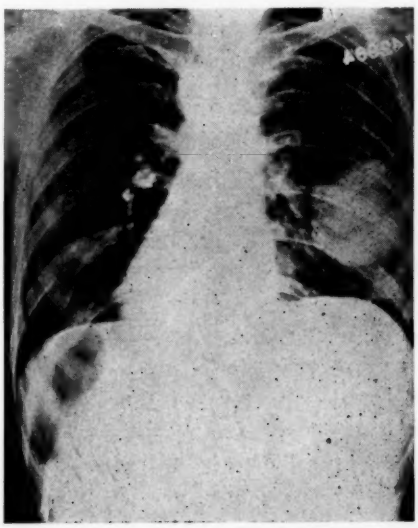

Fig. 4—(142964)—Interlobar effusion. The round shadow is much like that of the individual metastastic nodules in Figure 1, but a metastatic nodule of this size would be accompanied by others.

no accompanying lesions except a large calcified gland in the left hilum whose character was evi-

dent, and malignant metastasis was not even momentarily considered.

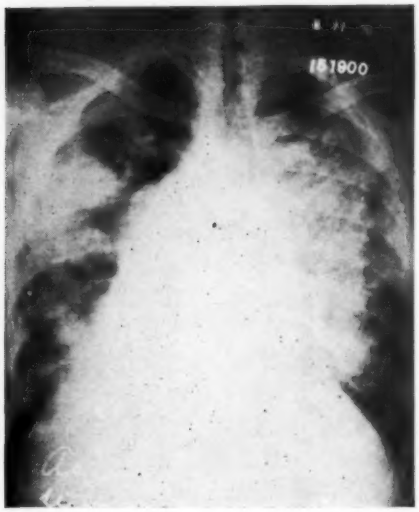

Fig. 5—(151900)—Syphilis of the lung. Fan-like infiltration, more marked on the right. Confirmation of diagnosis at necropsy.

Syphilis of the lung is usually listed among the possible roentgenographic simulants of pulmonary cancer. In one case, proved at necropsy, large patchy fan-like infiltrations, irregular in shape and density, and quite unlike pulmonary cancer, either primary or metastatic, were found in both lungs. Another case, clinically syphilis, was also of the pneumonic type (Fig. 5). A third case presented a large gummatous mass projecting into the hilar region. Association of pulmonary findings with mediastinal and cardiovascular changes shadowed in the roentgenogram should arouse suspicion of syphilis, and a positive Wassermann reaction will be reasonably convincing.

While the thoracic manifestations of Hodgkin's disease are commonly limited to the mediastinum, in exceptional instances the lung itself may also be invaded and the pulmonary lesions, as seen radiographically, exactly resemble those of malignant metastasis (Fig. 6). Various pathologists have recently been inclined to classify Hodgkin's disease with the lymphosarcomas, and if this becomes the established view any attempt to distinguish them roentgenologically would be superflous. One of our cases in which there were typical nodules in the lungs, could not be

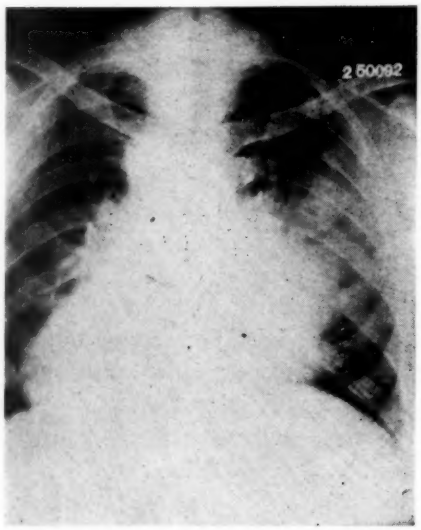

Fig. 6—(250092)—Hodgkin's disease. Infiltration extending from the right hilus. Diagnosis proved by biopsy.

distinguished roentgenologically or grossly at necropsy from those

due to other malignancies (Fig. 7).

Fig. 7—(332343)—Nodules in the lung in a case of Hodgkin's disease.

The "calcium metastasis" of Virchow which has been fully described by Harbitz, and more briefly by Crane, is, of course, not a malignant process, despite its somewhat suggestive appellation, and in the roentgenogram bears little likeness to pulmonary malignancy. The shadows are smaller than carcinomatous nodules, are often sparse, and their density makes their calcareous nature evident (Fig. 8). We have many examples of this type of metastasis in our plate files.

The differential diagnosis of the miliary variety of metastasis is much more difficult than the identification of the nodular type. Fortunately, the miliary type is far less frequent than the nodular. Simulants from which it should be distinguished are the miliary type of tuberculosis and pneumonoconiosis.

In acute miliary tuberculosis the lesions are more numerous, smaller, and less dense than in miliary metastasis; if the miliary tubercles are associated with chronic tuberculosis the shadows are likely to be more dense because of a deposit of mineral matter in the central necrotic zone. Tubercles grow by forming conglomerate masses and are therefore irregular in outline and tend to cavity formation (Fig. 9). In metastasis the growth is by uniform peripheral extension, producing a regular outline. In tuberculosis the tubercles are distributed most thickly in the upper and middle portions of the lung, leaving the bases relatively

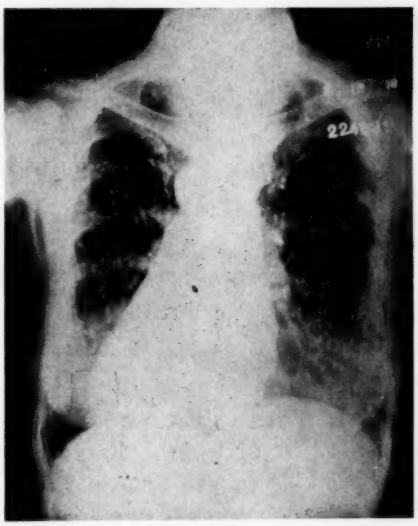

Fig. 8—(224531)—Calcium metastasis.

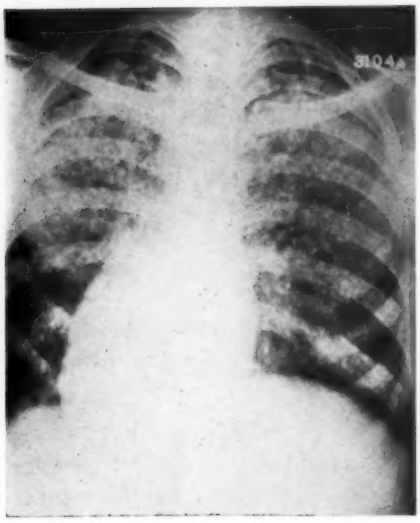

Fig. 9—(310447)—Miliary type of pulmonary tuberculosis.

clear, whereas the areas of metastasis are often most numerous in the lower two-thirds of the lung and the bases are clouded with them.

The differential diagnosis of metastasis from pneumonoconiosis is seldom difficult. Pancoast, Miller and Landis, have noted three stages in the development of pneumonoconiosis; (1) increase of hilar and trunk shadows and prominence of the linear markings; (2) mottling throughout the lung structure involving especially the middle portion opposite the hilus, and (3) diffuse, dense fibrosis resembling consolidation. Malignant metastasis is not easily confused with either the first or the third stages of pneumonoconiosis, and in the second stage the smaller size and greater number of the mottled shadows, as well as their principal distribution in the middle portion of the lungs distinguish them rather definitely from miliary metastasis (Fig. 10). The most common mistake is the diagnosis of tuberculosis in cases of miliary metastasis. This may be explained by the comparative frequency of the former. Furthermore, some of our apparent errors may be merely incomplete diagnoses (Table 2).

The credit for teaching that tuberculosis and cancer are incompatible has been given to Rokitansky. Broders, however, has interpreted Rokitansky's teaching to mean an antagonism rather than an incompatibility; he gives an extensive bibliography of observers who have noted the coexistence of the two conditions, and cites 236 cases

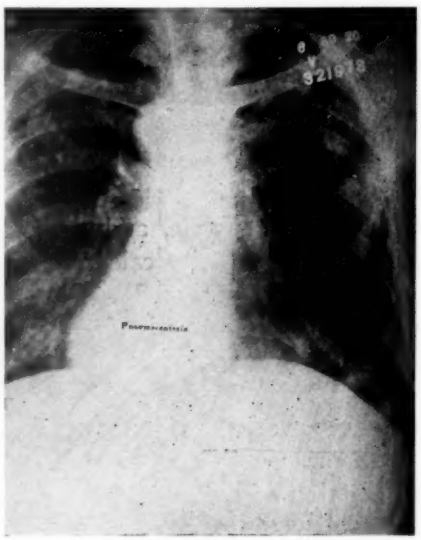

Fig. 10—(321973)—Pneumoconiosis.

TABLE II.—DIFFERENTIAL DIAGNOSIS

	SIZE	DISTRIBUTION	APPEARANCE
Nodular metastasis	0.5 to 6 or 7 cm.	Both lungs. Most common in right lung.	Usually large. Dense homogeneous areas. Borders sharply circumscribed.
Miliary metastasis	4 or 5 mm. to 1 cm.	Uniform throughout the lungs with most involvement in the middle and lower lobes. Growth is by peripheral extension.	Innumerable round, slightly irregular discrete areas of increased density. Areas are larger, denser and less numerous than those in **acute** miliary tuberculosis. Areas are likely to be less dense and less confluent than the tubercles seen in chronic tuberculosis.
Miliary tuberculosis	Tubercles smaller than metastatic nodules.	Upper and middle lobes are most frequently involved. Bases are usually clear.	1. **Acute miliary tuberculosis:** Areas smaller, less dense and more numerous than in miliary metastasis. 2. **Chronic tuberculosis:** The tubercles tend to form masses, irregular in outline and denser in appearance than the areas in metastasis. Marked tendency to cavity formation.
Pneumonoconiosis (Special stage only)	Areas smaller than in metastasis.	The middle portion of the lungs is mostly involved.	The areas of mottling are less dense and more numerous than in metastasis.

of concurrence in various organs, adding twenty cases of his own in which both pathologic processes could be demonstrated microscopically in the cervical and axillary lymph glands. Concurrence of pulmonary tuberculosis and metastasis was suspected in several of our cases, and proved at necropsy in one. When such association exists, roentgen differentiation may be very difficult as one lesion may destroy the characteristics of the other, or only the predominating lesion may be recognized.

Differential indicia derived from our own observations are not advanced as being pathognomonic. It must freely be conceded that atypical cases of pneumonoconiosis, miliary tuberculosis, and miliary metastasis may easily be confounded even by an experienced observer. It follows, therefore, that the roentgenologist should be informed with regard to the age, sex, and occupation of the patient, and the presence or absence of a primary focus to correlate with the roentgen findings, or the correlation should be made in conference with the clinician.

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A Symposium of Observations on Radiotherapy

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MUCH has been written, and vastly more has been said, concerning the more recent methods that have been evolved in Germany in Radiotherapy, more particularly in the treatment of malignancy, but inasmuch as a personal visit to these centres aids one in conceiving the modus operandi, a short resume of these observations may prove of interest, so that I will try to cover the field as completely as is possible.

To get down to actual observations, inasmuch as I feel that you are desirous of something that is not too lengthy, I will hurriedly pass over the part that is probably better known to you; that is, the work of America and England—but in passing may I be allowed to state that in my opinion the diagnostic "work" on this side of the water is superior to the majority of similar work that I chanced to observe across the pond. The same applies to apparatus, and so much is this the case that it is really difficult to conceive how or why men who are so fully conversant with the physics and the practice of Radiology, should be plodding along with mediocre appliances, and in quarters that are not only inadequate, but in many instances actually unhygienic, but I suppose one must allow that more credit is due them for the excellent quality of their work on this account. Then, again, one must remember that it was on this very apparatus that so many of the principles of today were elaborated.

It was rather pleasing to find that the largest x-ray clinic that I visited anywhere was at home in Canada, at the Toronto General Hospital, under the direction of Doctor G. E. Richards. (*) There is one item in this department that I believe should be brought to the notice of the Society, and that is a "Gastro-Intestinal" table, designed by the Director of the Department, which combines all the advantages of the Cole Table and in addition to this allows for Fluoroscopic observations and palpation, which appears to me a very desirable, even essential, thing.

However, as the point of real interest today appears to centre in the work of Europe, more par-

*—I understand from the Rockefeller Report that it is second to Mayo Clinic.

ticularly that of Germany, I will confine the balance of my remarks to what was seen there.

We have all been rather astounded, as well as interested, to learn of the heroic measures that are claimed to prevail in the administration of Radiotherapy in Germany. Their methods of treatment differ in many respects from our procedure here. Not only is the penetration claimed to be greater, but so also is the filtration, the target-skin distance, and, consequently, the time is considerably in excess of the time that I found common in America.

But probably the best way to review it in an orderly fashion would be to begin with the apparatus.

Various men are using different types of apparatus, but the principle of all appears alike. These types consist of two coils with the primaries and secondaries in series. The line leads directly through a resistance into the primary of one coil, then through an interrupter, and on with the primary of the second coil, through the balance of the resistance, and so completes the circuit on the primary side. The secondary windings are connected in series through a vacuum valve which "holds up" the increasing potential until the pent-up energy bursts through as a very high and consequently almost constant voltage, which is said to be about 200 to 400 Kv. This is the working of the Symmetrie-Instrumentarium, manufactured by Reiniger, Gebbart and Schall of Erlangen, and used almost exclusively in the Frauen Klinik of Seitz and Wintz in this place. An instrument practically identical in construction, appearance, and in the claim of the manufacturers is the one made now by Schall of London, in use at the present time at the West London Hospital.

There are other models which have been developed to meet the requirements for a higher penetration. Principally among these others are the Dessauer and the Veifa Reform. Any of these are, I am told, capable of developing and delivering continuously a current of 3 Ma. at 240 Kv., and are essentially alike. Some of them are constructed to operate a single tube; others twin tubes, while still others will operate four tubes at the same time, holding this terrific potential at each of the four tubes.

What appears to be a most recent refinement, however, is an installation which is entirely separated from the patient by a lead wall and the tube is enclosed in a grounded lead compartment, which of course, is fixed. The patient is adjusted to the tube, rather than the tube to the patient. Because of the fact that all the wires are enclosed within one lead-lined chamber, which is grounded, the danger of high tension wires is completely eliminated, and, further, it is not

necessary to increase the discomfort of the patient by submerging him under the heavy lead rubber protective that we use here. Sir Robert Knox in discussing this particular contrivance, expressed his approval and suggested that the armentarium of the Radiologist of the future would consist entirely of this type of appliance, but with a mechanical contrivance which causes the tube in operation to travel in a circle while accurately directing the beam to the growth.

There seems to be some dispute as to what the kilo-voltage they are using actually is. I may say that they are measuring it between fairly sharp points, with a maximum separation of 40 Cm. Incidentally, I think a factor which should be taken into consideration with reference to this measurement, is the fact that the breaking across this gap of 40 Cm. is in a room where there are several machines in operation and have been for hours, so that the air is vitiated to a degree that it can no longer be called normal atmosphere, as I think there is ionization of the room air and this would seem to discount the reading. Hirsch of Altoona says that the 240 Kv. is quite correct, but that is measuring at the secondary terminal without the tube in circuit. On this point there seems to be considerable contention.

While on the question of apparatus, mention should be made of the instrument devised by Pilon of Paris. Here a step-up transformer is connected with a condensor through kenotrones wired in reverse directions in such a way that the first impulse in one direction passes through the kinotrone to the tube. The second impulse in the inverse direction is directed by the other kenotrone to the condensor, so that when the third impulse comes along, to it is added the further potential of the stored energy in the condensor. So that with a transformer delivering a given Kv. it can by this means be augmented and is made to deliver practically double that voltage to the tube terminals. The tube in this instance is the Universal type Coolidge tube, immersed in oil and mounted on an overhead track. The principle of the apparatus is identical with that shown by Professor Duane of Harvard. The essential difference is that Pilon's Condensor appears about one-quarter the size of Professor Duane's and he has done away with the gigantic filament heating transformer for the kenotrones, so that the whole apparatus is more compact and certainly more suitable for a hospital than this enormous assembly that I saw in Boston.

However, what I did see myself was an actual sparking across between these sharp points at thirty-seven centimeters with the tube in operation, but this was just an occasional spitting across

and not a continuous flame. As I had no means myself of measuring, this, like many other statements, had to be accepted as given, so that I am passing it on just as it was received.

While on this subject, I would like to mention a really pleasing contrivance, known as the Oscillograph, shown me by Doctor Voltz, which consists of an oscilloscope mounted in an eccentric manner on a revolving black drum. This Oscilloscope has its terminals connected in series with a tube in operation, and because of the speed at which it is revolving, the luminous fluctuations between the points of the Oscilloscope become actually a continuous "graph". In a most simple and pleasing manner the behavior of the tube can be observed and recorded by photographing this oscillograph in motion. Doctor Coolidge, I believe, has obtained photographs of the various tubes in operation, connected to this Oscillograph, and, according as I understand it, he claims that the potential (their 240 Kv.) is equivalent to our 13-inch S. G. But allowing this is so, it is a higher spark gap than I observed being used previous to this European trip, although I have seen men who are using probably close on to that now.

Now, with reference to tubes: there are quite a variety of tubes in use. The Mueller Boiling Tube appears the most popular. It is a gas tube with a metal reservoir in which water is kept constantly at 100° C, as advantage is taken of the 537 calories necessary to convert water at 100° C to steam at 100° C, so it boils constantly and in doing so maintains a constant temperature of the target during bombardment, with the result that a more homogeneous bundle of rays is emanated. This is one factor that is kept constant, then to maintain a constant vacuum it is fitted with an accessory automatic regenerator devised by Wintz of Erlangen. This is a most ingenious device and consists essentially of a Milliampere meter which instead of registering the current passing can be set for a given milliamperage, say 3 Ma. Then if the tube hardens with a consequent decrease in the milliamperage this device, through a sensitive system of electrical relays, charges a solonoid, which operates the control cock of the gas flame playing on the palladium rod of the osmotic regulator. This in turn permits the entering of gas into the tube, with its resultant reduction, but only to the point desired: namely, 3 Ma., as when this is reached, the regulator causes the gas flame to diminish in a similar but reverse manner to that described, so that the tube is practically kept constant. During a treatment this reduction occurs with an irregular frequency and the apparatus is apparently quite automatic in its

operation, although an attendant "stands by" constantly.

In addition to this Mueller Boiling Tube there is a hot cathode tube, also a Mueller product, which is having a very limited use. It appeared to me to be essentially a Coolidge Tube but complicated by an additional heating filament, and the reason for which the physicist at the Mueller factory would not explain to me. There is also another with a Quartz cylinder, surrounding the target, which I am informed by users of the tube is a detriment to it, as when it becomes ionized it upsets the internal equilibrium and renders the tube unstable and so of questionable value.

The Lilianfeld tube is rather a handsome and complicated looking affair, consisting of several glass bulbs with a length of almost a meter, also a hot cathode tube with a most cumbersome looking aerial regulator, but which I am informed requires a particular type of generator (the Radio-Silex) to excite. While this tube is used to a certain extent, there is some diversity of opinion as to the particular field in which it is of the most value. In the laboratory of Professor Albers-Schonberg, I was told that it was the ideal tube for radiography, and that by it the finest detail could be produced. However, in other laboratories I was informed that it was quite useless for radiography but excellent for therapy, but that its use was limited as the tube had not yet been refined to its highest degree of perfection, although it is spoken of in a most hopeful manner.

The only other tube that I found in common use was the Coolidge-Furstenau Tube. This is a similar tube to our own Coolidge tube, with the exception that the bulb is slightly bigger and the terminals longer. I think that a misfortune has occurred with regard to it. Throughout Germany it appears to be an uncertain quantity, because an occasional one appears unreliable, and on this score a rather interesting observation was made while in Paris when going over the factory of Gaiffe-Gallot & Pilon. Doctor Pilon was showing me the tubes which they make under license for the supply of France. Here I noticed that the target in their tube had a dull appearance, instead of the polished metallic lustre that our American tube has. On pointing this out to Doctor Pilon he stated that it was their means of checking, as they found by experience that if the prepared target was touched by the bare fingers that it was quite impossible to satisfactorily exhaust the tube into which that target was built, and it was a source of continual annoyance until the trouble was discovered, after which they were sand-blasted, not entirely with a view to avoid the sealing of inter-

molecular spaces, but rather because of the surface, any handling was easily seen by the grease mark left, and therefore no attempt was made to use that target until it was again prepared.

Doctor Coolidge, I believe, says that this precaution is not necessary in America, so that it would seem that there must prevail some peculiar physical conditions which upset the equilibrium of the German tube, and therefore may be responsible for the erratic behavior of the German tube, which is to be seriously regretted. They do admit that it is the best tube, the most universal, and the most flexible when they get a good one, so that I believe that their trouble is entirely due to their local manufacture, and not in any way a reflection on the efficacy of the tube.

With reference to their methods of estimating or calculating dosage, several appliances are in use. One is the Intensimeter of Furstenau, for the operation of which advantage is taken of the peculiar properties of selenium, which has a varying electrical conductivity under the excitation of ordinary or "x" light. This contrivance consists of a selenium cell, electrically connected to the dial of the instrument or scale, which is divided off into 100 arbitrary units, known as Furstenau Units, this in conjunction with an apparatus called a "Wasserphanton", forms an experimental means of determining the dose delivered at a given depth. The Wasserphanton is a cubicle water container which allows of the holding of this selenium cell at any fixed depth. Therefore the actual dosage to be delivered to the tumor mass can be pre-determined and thus duplicated.

There is an accessory instrument in the form of a computing scale called the "Hartezkale" based on the principle of a sliding rule. The difficulty, however, with this instrument, I am told, is that temperature and humidity affect the sensitivity of it. So that under ordinary operating conditions it is subject to a 40% error and consequently would appear to be hopeless as an exact erythema dose criterion.

The instrument that really impressed me was the Iontoquintometer, which consists of a very small ionization chamber; the actual size being about that of a tailor's thimble, which is very much smaller than anything hitherto developed, and so it can be inserted into the body cavities and connected by means of a flexible cable to the electroscope, the actual dose administered thus being determined. The only objection that arises in my mind to it is the fact that the direct beam impinging on the metal walls of the chamber in themselves set up secondary radiation within the Ionization chamber, and this will hasten the rate of ionization and consequently subject the reading to a slight error, but inasmuch as

this factor is practically a constant, the exact conditions under which the reading was obtained can be duplicated, so that it would seem that this is not a practical disadvantage. This instrument would consequently appear as a very valuable addition to our means of accurately calculating dosage.

With the aid of the Iontoquintometer a rather interesting procedure has been established at Erlangen where they have selected a tube which is operated under certain fixed conditions until an erythema dose, as determined biologically, has been delivered to the living tissue. The record of the Iontoquintometer is taken and then this tube is set aside as their norm, to be used as a means of standardizing others, and is not actually used in therapy but retained as the criterion. It is guarded with the same religious care that any other standard is, and all the operating tubes are regulated according to this one. So that you can readily see that if the determination of this standard has been made with precision, and the working tubes carefully standardized, they will obtain results that are really difficult to duplicate with any other method that we have at the moment.

With regard to filtration, there is a variety of opinion and consequent procedure. In some of the clinics aluminium and sole leather are being used, aluminum up to 14 mm. in thickness, whereas in others they are using copper, zinc, brass and gold, the aluminum, zinc, and copper by far the most common. In talking over this matter with some of the operators, I find that the claims they make for copper, are almost parallel with those claimed for zinc; if anything the argument is rather in favor of the copper, and Professor Wintz confided that the reason they were advocating copper was that they had initiated the idea of a copper filter, whereas the Frieburg school had come out with the zinc filter, and that so far as actual results were concerned, there was no difference. Their claim is that 1 mm. of copper is equivalent to 17 to 19 mm. of aluminum. Working with a 10-inch S. G., the half-absorption value of aluminum varies according to whether or not the rays have been filtered previously. By "half-absorption value" is meant that thickness of aliminum that is necessary to cut down a given bundle of rays to one-half. It is found that with unscreened x-ray 2.5 mm. of Al reduce the quantity to 50%, which of course means that the other 50% is absorbed by the aluminium. Similarly, 3 mm. of aluminium absorb 60% of the incident beam. Now, taking this bundle of rays through 3 mm. of aluminium filter, it will require 4.5 mm. of aluminium to reduce this to 50%. Using 10 mm. of aluminium results in the

absorption of 85% of the primary beam and it requires 7 mm. of Al to further cut this to 50%. One mm. of copper causes the absorption of 93% of the primary beam, and it requires 11 mm. of Al to absorb one-half of the rays filtered in this way. This, therefore, is about the practical limit, as this is the hardest ray, and further filtration causes practically no difference in the quality of the bundle, but by securing a homogeneous bundle the absorption rate of succeeding layers of soft tissue will be practicly constant, therefore with a tension of over 200 Kv. as advocated, certainly heavier filtration than we have been used to is required.

In Professor Bumm's Klinik in Berlin the following technique is used:

Carcinoma of the Uterus

Filtration: Copper, 0.8 mm.; aluminium, 0.5 mm.; celluloid, 1 thickness (piece of photographic film).
Distance: 30 cm. target to skin.
M.-amperage: 2.
K.-voltage: 220.
Time: 90 minutes to each of four areas.

Myoma

Filtration: Copper, 0.8 mm.; aluminium, 0.5 mm.; celluloid, 1 layer.
Distance: 22 cm.
M.-amperage: 2.
K.-voltage: 180.

Elsewhere 0.5 mm. of copper filter is used, while still again up to 1 mm. of copper is used.

While the filtration varies from place to place, this is approximately the range used in deep therapy.

Baumister has done some experimental work with a gold filter of which he has determined that 0.18 mm. affords certain advantages, over a zinc or copper filter 0.5 mm., but because of the fact that it is almost impossible to obtain such a filter with less than 1% variation, and also in view of the fact that such a thin filter, when bent or buckled, disturbs the relationship of the material so that it actually varies in a wave-like form, he has dispensed with his gold filter and admits that the zinc or copper is really more practical.

With reference to distance, this also varies considerably: from 23 to 50 cm. seems to be the choice, although I did see work being done at distances up to 100 cm. In breast malignancies the technique is somewhat different, chiefly in the target-skin distance, which is greater, generally, than for "deep" conditions, 70 cm. and 90 cm. The Kilovoltage, current, and filtration, are the same, but the time is proportionately increased. Halberstadter of the Krebs Institute, Berlin, has a most remarkable series of encouraging results with this technique. So much so that he says carcinoma of the breast is no longer a surgical condition.

It is obvious that the increase in distance and filtration very greatly increases the duration of the treatment. When to this is added the fact that the tube delivers only two to three milliamperes, it is readily seen that the time factor is seriously pro-

tracted: in fact, under these conditions it requires from thirty-five to one hundred and twenty minutes to deliver the unit skin dose, and as this is for but a single portal, one must multiply this time by four or six for the complete dose.

When it is remembered that the patient under treatment is often seriously ill, and that the full treatment is given at one sitting, and to this must be added the necessary interruptions; the changing of a tube, readjusting of the patient, which is often necessary because of nausea or in cases where the patient finds it necessary to void, the treatment, including the interruptions, quite often runs from six to eight, and even ten hours, (in fact, up as high as fifteen hours at Schmieden.) So that it will be seen that the treatment becomes really an ordeal.

To assist in obtaining quietude of the patient during this session, scopalamine and morphine are administered, but even this does not to any appreciable degree alleviate the suffering occasioned by such drastic measures. Although attention is paid to the ventilation of the treatment rooms, yet the matter of roentgen sickness is an extremely serious one. The patient becomes intensely nauseated in most instances, and it may be so severe that the treatment cannot be completed, but the radiotherapeutists seem to pin their faith, rightly or otherwise, on the necessity of the whole dose being administered at one fell-swoop. On catechising them regarding this matter I was told in one clinic that in view of the fact that some of the patients came considerable distances, it was really a matter of convenience that the whole treatment be administered at one sitting. However, it was argued again by another individual in the very same clinic that this was not so, (and I think they are sincere in this belief), but that a precipitous dose must be administered if the treatment is to be successful. One of the premises for this argument was that the dose being an intense one, reaction was bound to occur, consequently the full dosage must be delivered before the beginning of the reaction.

That a reaction occurs sometimes sooner than one would ordinarily imagine is emphatically emphasised in a case recently reported by Alois Czepa, (Strahlentherapie: Vol. 12-239, Feb. 15, 1921) where a patient strangulated within one hour after irradiation of the chest because of the oedema induced in a bronchial gland.

With reference to the actual areas, the size of the portal used previously was 6x8 cm., with cross-firing based on the same principle to that which has been our custom here for some time back, but these are increased to as high as 16x18 cm., and even

in some places in the treatment of myoma the pelvis is irradiated from two areas only, front and back. In treating a malignancy in the pelvis six areas are used in Erlangen—three front and three back. Four portals are used at Berlin—two laterals, front and back. Inasmuch as the cancercide dose has been determined to be 100% of the erythema skin dose, this amount can be delivered at a depth of 10 cm. in a patient of 140 pounds, as they have shown that through each anterior lateral portal, 20% can be delivered to the depth of 10 cm. 23% through the anterior median portal; 20% through the posterior median portal, and 15% through each of the lateral portals, this being 113% of the erythema skin dose. Where a heavier patient is being treated an additional dose via the vaginal route allows for another 20%, so that the desired lethal amount can be obtained from this seventh portal.

For pelvic malignancy there has been developed at Erlangen a rather impressive method which, because of the analogy of its aim to the radical operation of Wertheim, has been called "The Roentgen Wertheim." In this an attempt is made to reach not only the primary growth, but also the lymphatics and glands in the adnexia and pelvis. No attempt is made to administer this whole dose at one sitting. Rather it is devided into three seances; the first, which includes the cervix and body of the uterus and its lateral parietes is administered through six portals; three in front and three behind (this in one sitting); the second covers the right parametrium; the third covers the left parametrium. Each of these are similarly divided. Because of the effect on the blood a minimum time of six weeks elapses between the first and second and between the second and third.

In preparing a patient for treatment, not only is the bladder, but also the large intestine, completely evacuated, and this may be repeated during the actual seance.

The tube is supported by a wooden holder properly isolated with lead, except a window for the primary beam. On the skin there is placed a wooden convex disc which, by pressing on the skin, forces it down and therefore secures surface homogeneity as well as helping to fix the patient, and, incidentally, acts as a soft filter next the skin. It further aids by dispersing or spreading the abdominal contents and therefore in certain areas where it is applicable, renders the depth of the tumor considerably less than if no pressure was brought to bear on the skin.

There are several points in the actual technique that impress one, among others is the exact precision which they regard as being of importance in the adjust-

ment of the tube and, so, the incident beam. This is done with extreme care, and to assist in securing the greatest exactness, one of the novel methods they employ is the use of a long dark glass tube, somewhat on the order of a Ferguson Speculum, about two meters long. At the distal end of it there is situated a small fluoroscopic screen at an angle of 45°, which is surrounded entirely by lead, except for one small window on a marked side. This glass tube is inserted into the vagina. The roentgen tube is then excited and it is readily observed whether or not the fluoroscopic screen lights up, so by the aid of it the path of the beam can be directed and the necessary adjustment made.

Treatment is directed toward the uterus and checked up by the lighting up of this fluoroscent screen above mentioned, so that the axis of each treatment actually traverses the uterus. The success of the treatment, it is argued, depends entirely on the correct orientation of the rays and really appears difficult although the description may sound easy.

Forty minutes with 3 ma. of current, .0.5 mm. of copper and 1 of aluminium at 23 cm. are the factors used in this dose in each area (in delivering the Roentgen-Wertheim). Such treatment, of course, is attended by rather serious sequela; roentgen sickness is almost invariably present, and the patient complains of malaise and anorexia for days after treatment. The vomiting may last as long as a week and not infrequently there is an associated diarrhoea and tenesmus with bloody and mucous stools. This may be more protracted than the nausea and may even go into the third week. The patient is kept in bed for thirty days and the skin annointed with a preparation known as "Zink Lovan." The whole of the exposed area blisters and desquamates.

In addition to apparent changes, there is also a serious effect on the blood. Examinations are made at regular intervals of six hours, then on the third day, and after that at weekly intervals. At times the haemolysis is so severe that blood transfusion becomes imperative, although in certain asthenic cases it is done as routine. These examinations show a rather sweeping destruction of the white blood cells, more particularly the lymphocytes, but these rapidly reappear. It is the disastrous result on the red blood cells that appears to be the serious factor. The average treatment results in the destruction of at least 25% of the red blood cells and their re-appearance is rather slow. It is not until after six weeks that the blood picture again resumes a normal appearance and for this reason the irradiations cannot be repeated until the R. B. C.'s are restored, so that eight weeks is the usual time and the shortest

period they consider safe is six weeks.

Experimental evidence, together with actual experience, shows that the blood will stand this severe destruction only a limited number of times, usually after four treatments the patient loses his ability to reform the blood cells, with the result that further raying causes an anemia that may terminate fatally, even in spite of the fact that the primary ailment, the cancer, has been destroyed.

It may be also noted that it has been determined that 135% U. S. D. is all that the bowel will stand without a disastrous destruction occurring, so that with this limitation known, 130% of the U. S. D. is the maximum dose that is allowed to be given to any patient.

This "Roentgen-Wertheim" has been in use at Erlangen since January, 1918, and it is extremely gratifying to review their statements of the twenty-four cases treated in this time, which, when reviewed in January, 1920, showed 23 of the cases were apparently cured. They are enjoying good health, they had put on weight, the mass had disappeared, and there is no microscopic or macroscopic evidence of malignancy. This is 97% of the first series. Of course it is unnecessary to repeat that it is too early to be sure of definite results, but these reports are surely encouraging and argue well for the method.

According to Professor Wintz, the technique is just as complicated and demands as high an order of skill to correctly perform as does the Wertheim operation. So true is this, he thinks, that he emphasizes his conviction that only specialists in this particular branch of medicine should attempt it, and it does require some experience on their part before even they are actually qualified to do it properly.

Just here may I be allowed to digress a moment to sound a word of warning. This technique is different in many respects from what we are used to here and if we attempt to change over, let it be done intelligently. Pfahler has taken a rational and conservative attitude on this, but he is conversant with the pros and cons of the practice of radiology. What I fear is an attempt by unqualified men, infused by the brilliant and unsurpassed results obtained, to attempt this work, which is entirely beyond them. The result will be terrible disaster in one of two ways, either horrible burns or the actual stimulation of the neoplasm by their doses being too small, and so the method, which is established beyond dispute, would be threatened to fall into disrepute by incompetent operators. Radiotherapy is a difficult, complicated, and highly technical specialty, and should not be dabbled in by any one and everyone. It is just as potent for harm as it is

for good, and is far more dangerous than a dirty probe in the hands of a meddling "surgeon."

It has been shown that the ovaries are three times more sensitive than the skin, so that the castration dose has been found to be 34% of the U. S. D. or 12 units as measured by the Iontoquintometer. The sarcoma dose is 60% to 70% of the U. S. D. or 24 to 26 on the Iontoquintometer. The U. S. D. is 100% or 35 on the Iontoquintometer, whereas the cancercide dose, which is 110% U. S. D. is 37. Here I may say that there is some apparent diversity as to the exact proportion of the U. S. D. that constitutes the cancercide dose. For example, Seitz and Wintz say 110%, whereas Halberstadter (Bumm's Klinik) says 90%. This is due to the fact that the reaction in Bumm's Klinik that is considered a unit skin dose is very much more severe than the one which is the standard at Erlangen.

The results of these treatments begin to be macroscopically apparent in fourteen to twenty-one days, but it takes considerably longer before the tumor entirely disappears, generally seven to ten weeks. Microscopic changes induced by this radiation appears identified with those following the exhibition of radium, with the exception that when radium is used they appear earlier and the retrogressive changes are more rapid, the difference being thus chiefly a matter of time in their occurence, not actually what occurs. The mass that has been subjected to x-radiation shows no microscopic changes until the end of three weeks other than the fact that the neoplastic cells stain more readily. This subject has been the source of considerable comment and some investigation by these workers, and they conclude it is not a biological action, but a purely physical one, dependent on the wave lengths of the gamma ray of radium as compared with the highly filtered x-rays. As a result of this treatment there is a most extensive cicatrization of the pelvic contents. Regarding this sequela I believe one must wait some time before it can be taken that there will not ultimately ensue disastrous results, because in cases already reported there has occurred an almost complete atresia of the vagina, so that this, if it can be regarded as an index of the resultant condition, is really a potentially dangerous one.

Experimental evidence would seem to indicate that the x-ray and radium have similar biological effects, although a radium burn is not so obstinate as an x-ray burn. If the same number of scattered beta-rays are produced in the tissue either from radium or x-ray, biologically and therapeutically they appear similar, although there is really a wide gap in the position on the

spectrum of the heardest x-ray produced today when compared with the hardest or shortest wave gamma ray of radium. While at the present time with the apparatus at our disposal, the extreme short wave x-radiations obtained are those excited by a tube with a potential of 250,000 volts, to simulate the shortest waved gamma rays of radium it will require a potential of close on 2,000,000 volts or a parallel spark gap of 16 feet. This of course, would appear to be beyond the limit of possibility and, even so, that of practicability.

So far I have been usurping most of the time in dealing with the question of deep therapy, but probably the moment of this subject justifies this monopoly. However, I would like to hurriedly make mention of some of the other achievements, and to call attention to the gratifying results that are being obtained in radiotherapy for tuberculosis. Here the technique is a small dose at frequent intervals and the results really appear excellent. The secret of the success appears due to the fact that proliferation of fibrous tissue can be caused *if*, and only if, it is previously sensitized by inflammation of pathological processes within it or about it.

On the question of increasing the coagulability of the blood, Stephan has demonstrated that by irradiating the spleen with a dose that is equivalent to about 15% of the unit skin dose, the coagulation time is increased with the same rapidity and to practically the same degree as follows a hemorrhage. As this occurs only by raying of the spleen, he argues that the spleen must be the source of prothrombin. It may be this or it is possible that a hormone is produced which results in an increase of the thrombokinase and prothrombin in the circulation. Based on this argument he is of the opinion that irradiating the liver, the spleen, the kidney, and other glands with minimal doses will have a similar effect, stimulating their specific functions. However, this work has not been done on the normal with a view to stimulating the secretions, but investigation has been carried on in cases of pancreatic deficiency, in renal incompetency, and he actually cites instances of three uremic cases where symptoms were so grave that decapsulization was being considered. However, after an experimental attempt at raying, the kidney excretion rose from a practical anuria to over 1,000 cubic centimeters in twenty-four hours.

In cases of diabetes mellitus their tolerance to carbohydrates was increased after raying the pancreas. There was not a complete suppression of the glycosuria, but an appreciable diminision. Further exposures were not successful in rendering them sugar-free, but further increased their carbohydrate tolerance.

Among other things he reports successes in the treatment of osteomyelitis and in chronic gonorrheal arthritis. Similarly, he has found that insufficient dosage delivered to a cancer mass had resulted in not only an increased cell proliferation, but also apparently an increased cell secretion, with the result that the cachexia became more marked and the patient was actually injured as a result of this misguided treatment.

The treatment of sarcomata appears eminently successful under radiotherapy and requires only 70% of the U. S. D. for its complete destruction.

Of course it is impossible to treat in an exhaustive way the methods in use or the diverse uses to which radiotherapy is being successfully applied today, and no attempt is being made to do so. But, in conclusion, may I say that, contrary to rather adverse criticism that I have heard regarding the methods as outlined above, I am personally convinced that in it a definite advance has been attained and when one considers statistics and actually sees the patients, it is convincing indeed. But aside from this the actual rationale appeals to one as being based on logical principles, so that this science is now becoming, or rather is actually already, established, and we are rapidly approaching the time when the surgeon must realize his total inadequacy to deal unassisted with malignancy. The knife can no longer stand alone as the panacea for cancer, because is it not a fact that if the condition could be extirpated with the ease that appears at present by some to be apparently assumed, the condition would not be a malignant one? And, further, is it not so that malignancy is a constitutional and not a local disease? That being so, and it certainly appears to be, it is too much to expect any surgeon, regardless of his ability, his technique, or his experience, to remove en masse such a recidivous condition as a malignancy. The ramifications, being more extensive than is macroscopically apparent, cannot with certainty, be reached, but even allowing they were perceptible, it is still quite impossible to completely eradicate them, because a dissection so extensive and so tedious could only be completed on the cadaver.

So that the future of this science is assured, and appears particularly promising, as it is pregnant with possibilities, and to hasten this a friendly and intelligent cooperation between the surgeon and the radiologist is indispensible. At the present day neither one method alone can claim the field, but by a close association, results can be obtained that were hitherto undreamed of, and real achievements accomplished.

Some Phases of Intensive Radiation Therapy

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BEFORE an audience composed of radiologists and their enthusiastic colleagues there seems little necessity of relating any indications for radiotherapy. We are inclined to believe that the usefulness of radiotherapy is recognized, that the limitations are not realized and that the failures are acknowledged.

In the first place it may be suggested that we declare our adherence to the principles and practice of tried and successful radiotherapy. These passing days are full of chaos with the rapidly changing technique of venturesome radiologists. The news from foreign parts is disconcerting to those who may be following the dose formulas of their chosen radio-hero.

Sucessful radiotherapy has been achieved uniformly in the superfiicial lesions of the skin. The latitude of dosage is such that success seems to attend the efforts of those who choose a single or multiple dosage and a filtered or unfiltered technique. It is suggested, however, that close adherence to the published dose tables of Witherbee and Remer (1) will always be good advice to those who have not passed through the fire of experience and the days of variable tubes, spark-gaps and filtration.

Personally speaking, I am inclined to favor what may be termed a graduated filtration dosage, which demands the exposure of the lesion, after careful protection of the surrounding parts, to the naked tube for one-third of the time and then using one and two millimeters of aluminum for the other two-thirds, respectively. One must take the superimposed crusts and scales into account as possible filters. The personal equation is an enormous factor in all this superficial technique and the garnerings of experience are more valuable than advice or study.

Among the conditions that lend themselves to sucessful radiotherapy and in which newer methods of technique will hardly afford any more uniform results, may be included the following:

1. Thymic enlargement of infants and young children. Almost any reasonable reontgen technique obtains results.

2. Tinea Sycosis. Any technique which accomplishes epilation affords rapid response.

3. Epitheliomata of the face from the eyebrow to the upper lip yield to any technique which protects the surrounding parts

and delivers sufficient radiation to promote a mild erythema.

4. Keratosis senilis. Yields to any radio-technique which is successful for epitheliomata. The lesions are multiple and widely scattered but there is little excuse for failure to secure results.

5. Tinea Favus. The success in this disease depends upon working out a technique which produces a uniform epilation without destruction of the hair-follicles by scarring. Results are bound to be satisfying although the variations in technique may be numerous.

There are without doubt many individual radiologists who register results to the point of specificity in other conditions than the above and there may be some among you who may feel that I have not included enough in the above listing. At least, there remains no argument as to the uniform results obtained by all radiologists in the above list if they possessed any knowledge of radiology before they secured apparatus, equipped with measuring devices.

Before proceeding to a consideration of deep radiotherapy problems, it may be well to call attention to the fact that I have omitted to mention eczema, psoriasis, erthyemata, thyroids, carbuncles, keloids, and other conditions which are quite extensively treated by radiologists. In these latter conditions it is not always best for the radiologist to be the primary attacking therapist. Radiotherapy is only one of many methods which are available in these conditions. Intensive radiotherapy may result in disaster if applied vigorously enough to control these conditions. Over-treatment is dangerous in many instances. Specificity of any treatment allows for latitude in technique. Multiplicity of therapies denies over-indulgence in any one method and should encourage a most careful technique.

And now to engage in a discussion of deep therapy problems, more especially in relation to malignancy. It may be well to lay down certain laws regarding radiant energy as displayed by the roentgen ray and radium.

1. The sensitiveness of the malignant cell to exposure to radiation is in direct proportion to the activity of its reproductive power. (Morson) (2).

2. Immature cells and cells in active state of division are more sensitive to radiation than are cells which have already acquired their fixed adult morphological or physiological characteristics. (Bergonie and Tribondeau) (3).

3. Infection interferes with radiation therapy results.

4. Inoperable is not synonymous with incurable. (4).

What are the *purposes of radiotherapy?* Fenzi has outlined these excellently as follows:

1. Prevention of inoculation of tumor cells into a wound.

2. Destruction of a growth in situ.

3. Treatment for relief of pain and discomfort.

4. To render the inoperable growths, operable.

The laws of the biological action of radiation have been outlined by Kroenig and Friedrich as follows:

1. The biological action of the rays depends on the quantity of rays absorbed by the tissues.

2. This action is (within wide limits) independent of the hardness of the rays.

3. Action is more powerful if the dose be administered at one time than if it is split up.

4. Action is stronger, with the stronger intensity of irradiation in unit time.

5. In practice, therefore, it is best to apply the whole dose in one seance with the maximum intensity.

The question of sepsis in malignant tissues being subjected to radiation, has not received the attention it deserves. Many of the inoperable malignant cases presented for radiotherapy have a mixed infection of the growth and the surrounding tissues. Now, there is no effect upon bacteria by the rays by any technique in ordinary use, only by enormous experimental dosage. In fact, Russ and Chambers have shown that prolonged exposure reduced the phagocytic power of the leucocyte. The lymphocytes were the more sensitive type and more readily destroyed. It is generally conceded that the lymphocyte is the most active cell in the destruction of malignant tissue. Therefore, any action of radiation which contemplates the destruction of bacteria in tissues must be in such enormous doses that the fighting lymphocytes will be destroyed and the resistance to the malignancy diminished. Morson (7) declares that the action of radiation in destroying bacteria is neutralized by the harm it does the leucocytes, and that the spread of a growth is hastened by radium if sepsis is introduced.

The problem of radiation in the presence of sepsis becomes extremely embarrassing when we contemplate the inoperable malignant conditions of the prostate, anus, uterus, mouth and jaws that are being presented for radiation treatment as a last resort. Practically nothing is accomplished unless the infection is controlled. It must always be remembered that it is the patient we are treating and not the malignancy. Too much attention to the malignant tissue and too little attention to the patient will not produce results.

Inasmuch as we have listed in an early paragraph, the tried and successful field of superficial therapy, it may be well to include

an estimation of roentgen values in the deeper tissues, with both benign and malignant conditions. To this will be added the analysis of Finzi with regard to the irradiation of individual tumor types.

The tissues and their peculiar diseases which are amenable to radiotherapy may be grouped under headings as follows:

1. Tegumentor. 2. Lymphatic. 3. Alimentary. 4. Gynaecologic.

The Tegumentary System is subdivided as follows:

(a) Metabolic Diseases—Acne Vulgaris, Eczema, Psoriasis.
(b) Benign Growths—Keloids and Warts.
(c) Cancerous and Pre-Cancerous Lesions—Keratoses, Epitheliomata, Rodent Ulcer and Sarcomata.
(d) Parasitic and Infectious Diseases—Tinea Sycosis and Favus, Carbuncles, Furuncles, Hair Follicle Infections.

2—The Lymphatic System:
Tonsils, Exopthalmic and Toxic Goitres, Enlarged Thymus, Tubercular and Chronic Inflammatory Adenitis, the Leukemias, Lymphosarcomata, Glandular Sarcomata.

3—Alimentary System:
Leukoplakia, Labial Cancer and Cancer of the Mouth, Oesaphageal Cancer, Rectal Cancer.

4—Gynaecologic Conditions:
Mennorrhagia and Metrorrhagia, Fibroids, Ovarian Papillomata, Cancer of the Cervix and Inoperable Pelvic Cancer.

Finzi (8) has outlined recently the forms of tumors for which radiation should be used, as follows:

1—Growths to be treated by radiation in preference to surgery: Lymphosarcoma and Rodent Ulcer.

2—Optional for Radiation or Surgery: Endothelioma, Epithelioma of skin and lip, Non-infiltrating epithelioma of tongue or palate, Cancer of the body of the uterus, Epithelioma of the penis.

3—Surgery to be preferred, but prophylactic radiation demanded: Cancer of the breast, rectum, ovary, tonsil, cervix, floor of mouth, pharynx and anus. Spindle cell sarcoma, alveolar sarcoma, melanotic sarcoma, hypernephroma and glioma.

4—Radiation contra-indicated in:
Epithelioma of the tongue of infiltrating type and Epithelioma of the vulva.

5—Benign Tumors to be treated by Radiation:
Angiomata, Lymphangiomata, Keloids, Fibromyomata of uterus after age of 38, Papillomata (warts and corns), Exopthalmic goitre.

The first of these classifications is distinctly anatomical and that of Finzi is pathological. Undoubtedly, a more thorough understanding of Finzi's ideas would reveal his reason for placing cancer of the fundus uteri in the optional class, and cancer of the cervix in the surgical class. We would turn this around and place cancer of the fundus in the operable class without argument because there is slow invasion of the lymphatics and adnexa and it is possible to take out the growth entirely. While in cervical cancer the patient has already suffered the extension of the malignancy into the lymphatics and the vaginal vault and complete excision is no longer possible.

The surgical clinics themselves are proving the values of radiation therapy in cervical carcinoma. Competent surgeons who also possess radium are slowly but surely learning to depend upon this newer therapy in malignancies which cannot be totally and completely ablated by the knife. It does little if any good to remove portions of malignant tumors.

Again, contrary to Finzi, we would place cancer of the penis in the 4th list as being not available for radiation. We have never been able to do any good for cancer of the vulva or the penis by radiotherapy.

It is noticeable that both the anatomical and pathological listings place tumors of the lymphatic structures in the radiation class. Undoubtedly this is the most easily influenced tissue in the body. It is not surprising that the radiation attack upon tonsils has sprung into prominence. Among the uninitiated there is a belief that the x-ray affects the bacterial infection in the tonsil but this is not a primary effect of radiation. Rather does that radiation produce a shrinking in the lymphatic tonsillar tissues and thusly the infection within the crypts is expressed as these shrink. This method of treating tonsils will probably only be an incident in the career of roentgen therapy in spite of its value and ease of accomplishment. It immediately engages the opposition of a well-entrenched specialty. Furthermore, the removal of tonsils is not difficult or dangerous. These are not sufficient arguments against radiation but they are efficient from the standpoint of the laryngologist.

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A Study of Eighteen Cases of Epithelioma of the Penis

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OUR reason for reporting these cases at this time is, first of all to present a new thought in the treatment of epithelioma of the penis, that is the use of unfiltered x-ray, in the hope that the knowledge gained by us in this particular field can become more widespread, and applied by many radiotherapeutists to establish the absolute value of this method of procedure.

Cancer of the penis is one of the oldest known neoplasms. References were made to this lesion by the early physicians, especially Celsus, Saporta, Hildanus, and Roland, who described tumors of the penis and methods of operation for this condition.

This disease is more prevalent than one would suppose. Various observers (Paget, Billroth, and others), have shown it to comprise 1 to 3% of all cancer cases occurring in the male.

Cancer of the penis occurs more frequently in the 5th, 6th, and 7th decades (C. Kaufmann). One case has been described in a young man of 18, and several cases between the ages of 20 and 30. Among our eighteen cases there was one aged 29, two in the thirties, five in the forties, five in the fifties, four in the sixties, and one in the seventies. Of these, fourteen were married and four single.

Phimosis has frequently been given as being a predisposing cause. Thomson describes a catarrhal balanitis occurring with phimosis, which lead to desquamation of epithelium and later a hypertrophy of the epithelial cells with overgrowth of the subepithelial connective tissue, to which Schuchardt gave the name, psoriasis preputialis. It is a significant fact of importance in this connection that there has been no authentic case of cancer of the penis observed among the Jews or the Mohammedans, who practice circumcision (Winiwarter). Czerny had been so impressed by these facts that he practiced circumcision as a prophylactic measure. Among our eighteen cases there was a marked phimosis present only four times.

Syphilitic scars or venereal warts have been frequently recorded as etiological factors. In three of our cases, the Wassermann test was positive; fifteen were negative, but of these two

gave a history of having had syphilis.

Trauma due to circumcision has been recorded in the history of at least one of our cases. There is a history of a warty growth appearing in the line of incision after operation for phimosis, which in the course of a year was definitely shown to be a malignant tumor. In one case there was a distinct history of trauma. This man, aged 70, received an injury on the glans penis by being struck by the handle of a plow. Eight months after he had an epithelioma which was confirmed by section.

References have been made to the possibility of the transplantation of epithelioma by contact with malignant disease of the cervix. This is not borne out by observation because cancer of the penis of men whose wives suffered from cervical cancer is not more frequent than in those whose wives are free from the condition. Among our cases there was only one man who gave a history of his wife having died from epithelioma of the cervix.

In the diagnosis of epithelioma of the penis we must take into consideration the possibilities of syphilis and venereal warts. Early epithelioma of the penis may be regarded as a simple wart or eroded papule (Partsch and Winiwarter), which is described as being more dense and pearly than a chancre, or as a smooth lump or thickening of the epithelium. During this stage there is little or no pain. As the disease progresses there is marked papillary or warty growth which soon begins to ulcerate, becomes cracked, infected, and suppurates. We have come to believe that all papillary growths on the glans penis are potentially malignant.

As a rule, local extension occurs relatively late, but eventually there is invasion of the lymph channels. The superficial vessels drain into the inguinal nodes, or invasion may be along the deep lymphatics of the urethra or dorsal vein of the penis, into the pelvic nodes. The inguinal nodes are involved in the majority of the cases when first seen (Kaufmann), and in over 75% of these cases it is bilateral (Martin). In some of the cases the inguinal nodes are markedly enlarged due to infection rather than metastases. This was proven by Küttner and bears out what we have observed in some of our cases.

It is possible, as study has shown (Küttner) that metastases may spread to the internal organs without involvement of the inguinal nodes. These metastases may occur in the liver or other internal organs. Rarely the disease is implanted by contact to the scrotum or skin of the thighs.

The most common site for epithelioma of the penis is on

the glans (Barney—69%); fourteen of our cases were in this location, and four were on the prepuce.

These growths are either of the papillary type, especially on the glans penis, or the infiltrating epithelioma which is the usual type found on the prepuce (Partsch). The histological structure of epithelioma of the penis shows numerous pearls and hornifications, which are also well marked in the metastases that occur in this disease.

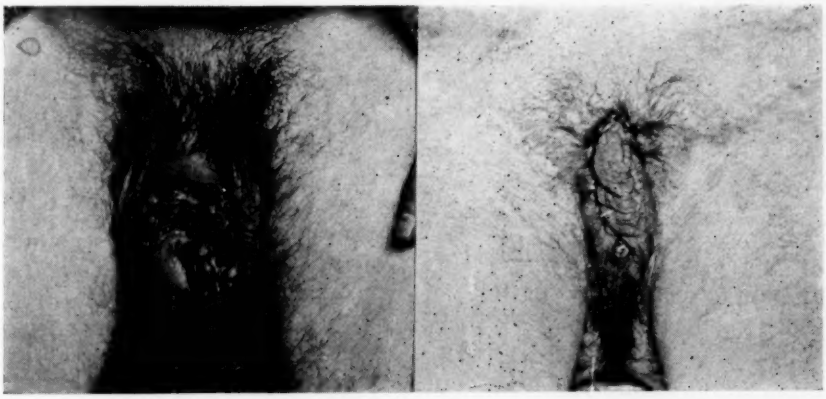

Figure 1—Case No. 1
Before treatment, May 15, 1918. After treatment, June 10, 1921.

There were two cases of malignant papilloma. In these there was marked surface proliferation with little tendency to infiltration or metastasis. Thick layers of irregular epithelial cells showing numerous mitotic figures, arrange themselves upon a delicate framework of connective tissue. This type is comparatively benign.

The course of the disease is usually relatively slow (Barney) before reaching the critical condition. Cases have been known to live eleven years without operation. The gross mortality is estimated about 32% Fifteen per cent of the cases develop visceral metastases. All types of cases give a 38% recovery by surgical methods (?). Recurrences are usually observed during the first year. A few occur from one to five years and an occasional case has been observed which recurred after eight years.

In this series the duration of the lesions, before treatment was instituted, varied from six months to two years. Six cases were far advanced and showed definite metastases. Of these three were operated upon. All in this group died. Twelve cases on admission had distinct palpable nodes in the groins; five of these were operated upon but showed no histological evidence of metastases in the lymph nodes. These cases are still un-

der observation. One case was treated by radical operation followed by radium, in which there were definite metastases in the groins. The disease recurred and the patient died eleven months afterwards. Radium alone was used in one case which was far advanced showing extensive involvement of both groins. Treatment was of no avail.

Three cases were treated by x-ray followed by radical operation, which consisted of amputation of the penis, removal of the testicles and scrotum, removal of all lymph-bearing tissue in both groins, and transplanting the urethra in the perineum. There were no metastases found in the lymph nodes in the groins. All three cases are alive and well after four years, three years, and two years. (Photographs, Case No. 1).

X-ray and radium treatment was used in two cases. One case was far advanced with defiinte metastases in both groins. Treatment was discontinued, unimproved. In the other cases, the lesion on the penis which was extensive, was treated with unfiltered x-ray in three sittings in the course of six weeks with twice the erythema dose each time. On account of enlarged lymph nodes the groins were packed with radium filtered through .5 mm. of silver, 1 mm. of lead, 1 mm. of aluminum, 1 cm. of rubber, at a distance of 6 cm., each groin receiving 9700 millicurie hours. The patient is alive and well six months after treatment.

Figure 2—Case No. 2
Primary epithelioma of the penis, before treatment. Eighteen months after treatment

X-ray with conservative operation was used in two cases. Operation consisted of amputation of part of the penis and removal of lymph nodes in both groins. One is alive and well two and a half years after the treatment. There were no metastases found in the groin in this case. The other man died one year after

treatment from recurrence of the disease, but in this case there was definite metastatic involvement of the lymph nodes in each groin.

Six cases were treated with x-ray alone. One discontinued treatment. One case is alive and well one and a half year after treatment. Fig. No. 2. One is alive and well six years after fractional doses of unfiltered x-ray. This last patient had a very small lesion on the glans penis. Three others are about

but also the areas into which the lymph channels drain. It would seem that the ideal treatment would be filtered x-ray treatment of both groins, and unfiltered x-ray of from two to three times the erythema dose on the local lesion.

Where there is definite lymphatic involvement in the groins, large radium packs supplemented by operation, or the implantation of emanation, or operation and unfiltered x-ray of the open wound is indicated.

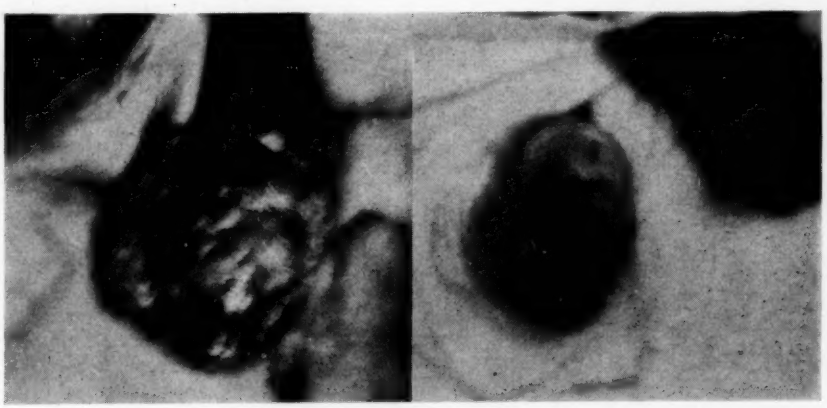

Figure 3—Case No. 3
Before treatment, January, 1921. After treatment, June, 1921.

healed, but are very recent cases. (Fig. No. 3). One case which was treated with filtered doses of x-ray was well when last seen, but has not been heard from in two years.

From the analysis of these cases it would seem that when the disease is local a cure can be effected by treatment of the lesion with unfiltered x-ray. It, however, is not only necessary to have in mind the local lesion,

The method most used in x-ray treatment of these cases was 10 milliamperes, 90,000 volts, no filter, at a distance of 20 cm. The time varied from five to six minutes which was approximately two to three times the erythema dose.

Conclusions

First—Cancer of the penis can be healed with unfiltered x-ray.

Second—X-ray treatment of the lesion followed by radical

operation, has resulted in the healing of three cases which have remained well for two, three, and four years.

Third—Where definite metastases are shown in the lymph-bearing tissue results of treatment have been only palliative or ineffective.

Fourth—It is expected by improved technique, and the earlier recognition and institution of treatment, that more cases of cancer of the penis can be healed.

Fifth—The implantation of small doses of emanation, supplemented by large packs, will prove of value in those cases which have already metastasized in the lymph nodes.

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The Importance of an X-Ray Study of the Spine Following Injury

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THE patient with a spine injury wants two things. He wants a diagnosis and he wants treatment. I have seen a good many medical reports on patients who have had industrial accidents to the spine in which the statement is made, "There is no objective evidence of injury." In a few instances, such patients have told me that they were not even stripped for examination. Careful x-ray in such cases is the exception rather than the rule.

The examiner must first consider the objective signs. If the patient says he has pain, there are many possibilities of deciding whether or not his statement is correct. One may look for bone deformity kyphus, flattening of the lumbar curve, etc. There may be a limp, list of the trunk to one side or the other, difficulty in getting up and down and consistent tenderness to pressure. There may be even diagnostic disturbance of protopathic or epicritic sensation—or both. All of these points and the x-ray must be taken into account in deciding for or against an inflammatory or traumatic spine lesion.

Moreover, it is necessary to consider the character of symptoms likely to be present immediately after or late following a traumatism to the spine. A diagnosis which is not made early may be more difficult to make but very important later on. This is especially true if a suit for damages is contemplated or in progress.

It is well known that a great many spine fractures are not diagnosed at all at the time they occur. Sometimes they are not recognized until many months of disability have gone by.

Two x-ray plates recently seen gave a diagnosis of fracture in the cervical region, in the third week after injury.

This man, eight months after injury, has bony union in bad position, his head is in a wry neck position and he is still classified as 50% disabled. He has never worn an efficient head or neck support of any kind.

Spine or sacroiliac injury, whether fracture or strain, calls first for immediate reposition. The parts should be restored at once to normal relationship or as nearly so as possible. Then an efficient device for maintaining correct position and for immobilization must be put on and worn until sound healing has occurred.

In injuries to the cervical region, the trunk and head must be fixed. In the lumbar and

Fig. No. 1.—Anterior-posterior view of lumbar spine, showing area of bone destruction on the right half of the body of one of the lumbar vertebra.

sacroiliac region one must immobilize one or both limbs with the trunk. In the dorsal region unless very high up an efficient spine brace or packet will do. In my own work, plaster paris is preferred.

In making the x-ray examination, it is important to bear in mind that the same rule applies to the spine as to the other bone and joint injuries, namely: a plate should be made in both the antero-posterior and lateral planes. This point and the importance of late diagnosis, are brought out in the case of which plates are shown here. (Figs. 1-2).

This patient, a young man, hurt his back three years ago. He has had some back disability ever since. At times, it is much more severe. He had attacks with severe pain in July and November, 1920. Upon the latter occasion x-ray examination by Dr. Roscoe L. Smith showed the lesion to be a destructive one of the third lumbar vertebra. Until that time, the patient had at no time during nearly three years had a proper diagnosis. In fact, it had been suggested on several occasions that there was really nothing the matter with his back. In November he was put to bed and within ten days was free from pain. Late in November, 1920, a bone transplant was put in extending from the first lumbar vertebra into the sacrum (Albee method). He is progressing steadily toward recovery. His back is entirely free from pain, he is gaining weight and will get entirely well as a result of

Fig. No. 2.—Lateral view of the same case, showing the destruction to be located in the anterior portion of the right half of the lumbar vertebra.

ideal (in this case surgical) immobilization of the spine.

Fixation of the spine—that is, jacket or brace—must be continued for a fairly long time. Eight to twelve weeks time is usually necessary to get sound healing. In injuries that are at all severe a spine brace (Ridlon or Taylor pattern) should be worn for several months even after the patient seems to be well.

In a few words, this paper is a plea for early accurate diagnosis of spine injuries or of disease sequelae, in which the radiogram is so important a factor and for early efficient treatment to which the radiologist can often point the way.

EDITORIAL

The JOURNAL OF RADIOLOGY

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The Spirit of 1922

CERTAIN fundamental things are absolutely essential if Radiology is to enjoy a broadened influence, and ultimately succeed in any large measure as a scientific agent serving the public welfare.

Such a statement may sound a trifle abstruse. But the time has come when that man or body of men seeking to attain the fulness of his or its heritage as an integrated part of the medical profession, a heritage, if you please, whose chain of succession depends entirely on human service, must observe in the present flux unprecedented opportunity for extended scientific inquiry; must inevitably feel that there is just cause for hope of renewed vigor in the present demand for a restatement of those purposes for which they stand committed—purposes which somehow must be made big enough at base to include all men everywhere, and at once bear unmistakable evidence of direct individual contact and benefit.

That kind of a program does not constitute an easy job either in the making or in the consummation. But the fact is, during the past couple of years most men have learned pretty thoroughly how to measure the value of scientific undertakings, especially where their own personal interests are involved: they have come to believe that they have a right to demand the achievement of those scientific things which enhance individual well-being and comfort that thereby the public health may be assured.

With this knowledge has come a peculiar ability to strip the professional man bare, to burrow clear through every pretension for the purpose of finding out exactly, once and for all, whether that pretension is grounded in fact and fortified by truth, and then, mercilessly, to leave him who professes the thing standing to defend himself against the world or falling under the scourge of public obloquy, according to the measure of individual value in those things done, or the public importance of those things left undone.

It makes no particular difference that such a procedure is more or less arbitrary, nor that it fails to take account of the manifold details which must be explored, understood, and co-ordinated into a common plan before the scientific man can be sure the thing which he aspires to accomplish is at all possible of achievement, or that once achieved, it will be susceptible of reduction to the public good.

There is plenty of evidence of the fact that the test of the common weal, as thus ruthlessly portrayed, has thrown its mighty arm across the

path of nearly all business men these past few years. Some have fallen before its vigorous push; others have been exalted and proclaimed the people's fortunate own. And judging from the indications which are the outcroppings of public opinion, the probabilities are that the same rules of conduct will be applied to professional life with unbounded vigor during the coming year. People must have a fetish to worship, a cause to pursue—and the medical profession seems to present that happy combination of both which holds tremendous possibilities. That is why 1922 will see actual deeds catalogued and appraised, aspirations submitted to the crucible of public opinion—and through the whole galaxy of human readjustments will reverberate a seductive clamor for professionally scientific men whose creed is "I can, and I will," whose prayer is "I have, and I must."

Men who would hold fast to principle will have to chart a course in advance and adhere strictly to facts. That is especially true of the medical profession, for there is an increasing purpose coursing through its veins. Radiology, simply because it is a branch or specialty of medicine, is not exempt. On the contrary, its latent possibilities, only the most meagre of which have been discovered and applied, clearly indicate that it may not with impunity trust its future to any haphazard program. The expanding horizon of preventive and curative medicine holds an inner urge whose intelligent application to the development of the science of x-rays, radium, and electro-therapeutics is vital. The Divine purpose of Radiology must be studied and charted, its principles and factors laboriously selected and explained, and the correlated expression of the whole placed in the hands of those men best fitted for the task.

The future holds a cross for every man. It is futile to play with words against the hope that the demand for a new vigor in professional life may be averted or stayed. It is idle to contend that the medical profession is sufficient unto itself, or that it proceeds on a high level of professional and scientific attainment where economic law or social necessity can command neither respect nor obedience. The fact is, professional men have for many years been telling other people how to live, and they now find themselves in that anomalous position where they have to prove their points by first-hand application of their own theories in order to demonstrate beyond peradventure that they speak with authority.

This does not present a situation altogether pleasing in prospect. But the evasion of duty or facts is not in the code of the medical man. Particularly is this true of the Radiologist who deals in tangible things, and whose shibboleth per se is certain discovery of cause followed by treatment based on known facts.

Thus Radiologists will not be permitted to remain content in their adolescence. They will be constantly reminded that facts are the yardstick by which their professional intent and worth are to be measured as a scientific agent in social life.

It seems but the part of wisdom, therefore, to try to set up some preliminary working plan. It is understood, of course, that such a working plan will have to provide sufficient latitude for individual vitality and initiative if it is expected to focus the activities of The Radiological Society of North America on the larger phases of future effort and achievement. It will have to be big enough, broad enough, to coördinate the efforts of Radiologists everywhere with the needs and desires of the medical profession. And it will have to com-

mand the admiration and respect of the members of this society by its preëminent purpose to unerringly set up those sign posts whose inscriptions must be read and observed as Radiologists proceed in the performance of their duties in the stirring march of events. Briefly, that program will have to underwrite the intelligent development of the science of x-rays according to the specific needs of the whole people in conformity with those profound truths which Radiologists have already come to recognize as the bulwarks of their profession.

One must approach such a problem in deep humility. The responsibilities are so great, the opportunities it offers so vast, that any man who sets himself this task must seem overbold. He is sure to learn that words and figures of speech are inept and weak. He must perforce offer in defense of a feeble intellect an unquenchable zeal for professional achievement, a zeal whose vigor must be expended in an ever-widening circle of service by a profession whose Alpha and Omega are life and death in the raw.

These are the thoughts which trouble the minds of the outgoing as well as the incoming officers. They know that in theory it is their duty to bring to the society membership some message of hope, of good counsel, and of infinite wisdom, to the end that the individual units of membership may go forward in the fulfilment of their professional obligations as a cohesive scientific precursor of physical and mental betterment in the composite social structure. But those same officers know, also, that such a spirit and unity of purpose cannot be invoked save in support of some program which is rooted in the Divine scheme of things, and which by its eminent practicability impresses each and every member with his individual responsibility and at the same time holds out some assurance of personal benefit.

To provide such a program is the duty of the offcers. It is the only way in which they can toll off that earnest of good faith and thoughtfulness and sincerity of purpose which is bound up with the performance of their duties. It is the price they must pay for their preferment in being clothed with the highest honors it is in the power of this organization to bestow.

In order, therefore, that there may be neither deliberate nor unwitting evasion of duty, the following suggested activities are submitted for the earnest consideration of the society membership. What is said is neither final nor conclusive. Rather, what is written is written for the purpose of stimulating discussion, inspiring individual thought, and laying the foundation for collective activity. It is hoped that as a natural consequence a program may be adopted at the annual meeting which will seek the achievement of those permanent things which are accepted by all men as evidence of righteous intent and irrevocable fealty of purpose.

Exemplification of the ideals which this organization has forged into its Magna Charta requires that the society members individually and collectively shall provide the flesh and blood which will stimulate scientific achievement, quicken the conscience of the world by magnificent and magnanimous social service, and firmly entrench the science of Radiology in the confidence and respect of all the medical fraternity and the public at large.

These are not empty words. They throb with the half uttered demands of thousands of honest and honorable practitioners who do not yet appreciate the full value of this science, nor the opportunity for extended service which it holds; they pulse with the

inarticulate feelings of millions of men and women and children whose usefulness as citizens in this great nation rests absolutely on the shoulders of the medical profession in the certain discovery of cause and the correct development of prevention and cure.

Those who have run the whole gamut of x-rays, beginning when the first attempts were made to incorporate it into the practice of medicine as a collateral aid for diagnosis, and continuing to its present state of dependability and wide range of utility, see so many things of importance which should receive the undivided support of this society and all others interested in the development of Radiology, that it is a trifle difficult to coördinate them into a single inclusive plan of action.

However, there are at least two major undertakings which embrace unlimited opportunity for the proper development of those things which lay close to the heart of every member of this organization, and which will provide that unity of purpose which is so essential to sustained effort and ultimate achievement. .They may be stated as:

1. A working arrangement with the faculty of every reputable medical college in the United States for the purpose of establishing Chairs of Radiology, in order that the regular curriculum of each medical school will guarantee proper grounding in medical and dental physiology and pathology, a working knowledge of the complementary sciences of physics and electrical engineering in their relation to the science of x-rays, and a comprehensive study of the newer science of electro-therapeutics.

2. The creation, within the profession itself, of the necessary agencies for the serious study of the public relations of the profession from the socio-economic side, and coupled with that, an unprejudiced and exhaustive effort to develop and harmonize the functions of the interrelated and interdependent branches of medicine, the better to serve the public health.

A brief discussion of ways and means may prove of some value.

Medical colleges are of three classes: first, those maintained and operated as a part of our national and state educational systems; second, those supported by endowment through the favor of some person or organization; and third, those conducted by individuals or groups of individuals as self-sustaining institutions.

These details are set up for the purpose of indicating that no particular difficulty should be encountered in accomplishing the establishment of Chairs of Radiology. The first class of schools embraces those public institutions which are by their very nature subject to the demands of the public interest and operate with their ears pretty close to the ground. The officers of these institutions will undoubtedly be found perfectly wiling to coöperate with this society or the Radiological profession generally in any serious effort to raise the standards of medical teaching as by equipping their students with a more thorough and practical knowledge of all the collateral sciences of medicine. What has been said applies with equal significance to those schools of the second class. And those of the third class will not be slow to adopt methods which will increase student registry once it becomes certain an organization like The Radiological Society of North America is behind the proposition.

By way of comment: Already a few of the more progressive medical colleges are giving instruction in Radiology. Some have established chairs; others are providing lectures. This fact should lend emphasis to the practicability of, and necessity for all

other reputable colleges adopting a like course.

Without fear of over-statement, therefore, it would seem to be the duty of members of this as well as other like organizations, to offer their services as instructors and members of faculties for the purpose of assuring the success and certain benefits of such a movement.

At this juncture, forethought suggests the interpolation here that the benefits of this educational undertaking can be very materially increased by the creation and maintenance of a research bureau. Such a bureau can be established by this society singlehanded or in conjunction with all other organizations interested in Radiology, as in the judgment of the membership seems best.

In addition to serving the Radiological profession in an utilitarian manner by way of conducting experiments, prescribing protective measures and devices, testing apparatus and equipment, disseminating information, and other duties too numerous to be recited here; conducting scientific explorations for the purpose of benefiting and extending the applicability of the science of x-rays and cooperating with manufacturers of equipment and appliances—such a bureau if properly constituted and conducted, could be of incalculable assistance by compiling in permanent form all the information of value on every phase of diagnosis and therapy pertaining to every branch of medicine and dentistry accumulated by Radiologists in the pitiless school of experience, and supplying it to medical colleges for their use and guidance. This would most assuredly serve to unite theoretical instruction inseparably with good practice and provide a source of constant intercourse between teacher, student, and practitioner—a thing whose benefits for all parties cannot be measured in tangible terms.

Such a bureau would also serve to identify this society and the Radiological profession with constructive leadership, and enable it and them to create greater professional and public confidence in the science of Radiology, expand its uses, and secure the manufacture of apparatus and appliances in accordance with good standards.

So much for this phase of the subject, which involves the scientific side of the proposition.

The question of public relations is one of tremendous importance. A great deal has been said about various aspects of the subject by men in the profession and out, but nowhere has there been the slightest suggestion that it may be possible to organize all branches of the medical profession on some deliberate plan for national social service. Yet that appears to be the way out of the present dilemma. Certainly there is sufficient opportunity in such a program to satisfy every medical man, even the most belligerent advocate of state medicine. For in a comprehensive undertaking to introduce order and purpose into the medical profession to meet the requirements of a large social service, direction will be afforded for all the surplus energies of every man interested in the subject in devising administrative methods by which the great human resources of the country can be safeguarded.

Radiologists are perhaps more vitally concerned with this problem than is any other specitlay of medicine. Radiologists must maintain large investments in physical plant. And those investments have to be considered in arriving at a schedule of charges which the public is asked to pay. Not only that, but those charges must be justified. Quite naturally, therefore, the question of hour cost of operating various classes of equipment in the various classes of cases which pass through the average medical radiologist's laboratory is something

to conjure with. And this is not all: there is the additional problem of arriving at the proper amount to be set aside each year for depreciation, interest charges, overhead expenses, diagnostic service, insurance, etc.

These details are mentioned because the public has a very real interest in them. That it is not altogether satisfied with the sort of answers thus far given to its embarrassing questions is pretty conclusively demonstrated by the almost universal effort to establish some form of state medicine, industrial medicine, compensation insurance, and other forms of paternalistic health indemnities, in each of which medical fees are fixed without regard either to money investment in laboratory or in professional knowledge and skill.

It's a long cry from the open sesame of barber bleeding to the present scientific practice of medicine. The distance traversed in so short a period of time is nothing short of remarkable. But the profession has been so intensely occupied with the scientific development of its practice that it has not given any serious thought to the economic or social side. That it must now do at its own peril.

As a beginning, it is suggested a committee should be appointed to study this phase of medical practice, and since this committee is to be a creature of this society, it should give particular attention to the peculiar conditions of the Radiologist. This committee should study operating costs, laboratory investments, depreciation and interest charges, accounting systems, insurance and protective problems, administrative methods generally, for the purpose of making recommendations concerning reasonable charges, classes and kinds of apparatus and equipment best adapted for various kinds of radiographic and therapeutic work. It would seem that each laboratory might be studied with reference to five divisions of cases, i. e. genito-urinary, gallbladder, gastro-intestinal, chest and bone.

The information which will naturally result will provide a very tangible basis for outlining a plan of activity which will answer the socio-economic requirements of the profession. Certainly it will dispose of many of the vexatious riddles every Radiologist encounters every day in his regular routine work.

From this base, also, it should be comparatively easy to set up a program which will coordinate the activities, both present and potential, of the Radiological profession with those of all other branches of medicine, and give direction to scientific research and cooperative effort.

It is realized these are major undertakings. It is also realized they cannot be accomplished by a mere wave of the hand. But it is believed they can be accomplished by that steadfastness of purpose which springs from an appreciation of their value, by that sustained effort which has brought the science of medicine to its present state of reputability and respectability, and by that painstaking study of cause and effect which every Radiologist gives every day to cases coming under his observation.

That all these things can be reduced to a common method for a common purpose—the conservation of the public health through an organized medical profession—there is not the slightest doubt. They are the natural problems which go with the science of medicine. They are the problems of leadership. They will be, they must be answered by some organized force, if not by the medical profesison in response to its social obligations, then by economic agencies which will impose certain penalties for failure to function.

The spirit of 1922 is already casting its shadow across the full length and breadth of the medical profession. The opportunity is ours. In all sin-

cerity and fraternity these suggestions are submitted for consideration and action.

State Medicine

A GOOD deal of press comment, professional and lay, has been incited by the recent action of the Board of Trustees of Johns Hopkins Hospital in fixing maximum fees for surgical and medical attendance.

Nowhere, however, so far as has been observed, has there been any serious effort to throw off the sickening shroud of hysteria over fee fixing, and discuss the principles involved once they have been come at: nowhere has there appeared any one imbued with that innate nobility of purpose which is generally conceded an accepted fact with the medical profession, and stripping the situation of all non-essentials, shown the utter futility of following the vicious circle thus set in motion to its logical and absolute conclusion: nowhere has any person, within the profession or without, come forward with the courage of his convictions and tread under an iron heel the implied imputation that the medical profession is evading the full responsibility for its inevitable part as a functioning unit in the composite social structure.

These are the purposes which run through this thesis. Perhaps some of the practices of the profession which have come to be received and recognized as honored customs will fall under the axe. Perhaps some of those practices will be justified up to the point where they give birth to a combination of circumstances and conditions which no self-respecting member of the profesison will tolerate, and then vehemently denounced because they prove themselves not what they seemed. And perhaps, just perhaps, in what is said will be found cause for calling into action some of the latent energies, some of the hidden resources of the profesison to defend that profession against the insidious onslaught of encephalitis.

So that, if in the thousands of words which constitute the English language can be found any vigorous enough to picture the importance of getting right on this question now, if in stumbling about to get at the striking features of the principles woven into the texture of the thing, something is said or implied which will galvanize the profession into certain activity in the development of a specific plan for achieving a better public health, then the effort will have been more than compensated and whatever of calumny may follow will be thankfully received.

It is perhaps well to say here, in order that no misapprehension of intent may be possible, that there is no thought of calling into question the sincerity of purpose of the Board of Trustees of Johns Hopkins Hospital. Nor is there any thought of impugning the motives of the Rockefeller Foundation by which that hospital is maintained under endowment. The Board of Trustees of Johns Hopkins have a very real and distinct trust to perform. That they are performing it with a singleness of purpose which merits the entire approval of every thinking man is proven by the fact already alluded to. And the work which that hospital and that foundation have done in the past, are doing at present, and will most certainly do in the future, is both commendable and invaluable. The human family at large, and the medical profession in particular, abides in profound obligation for the exhaustive and far-reaching research accomplished and planned by the staff of Johns Hopkins and the Rockefeller Foundation.

The irony of the thing is in the fact that such important and beneficial work has not been undertaken under the direction of and prosecuted by the profession as an entity in the discharge of its avowed obligations to serve society in a material and physical way

as by conserving the ability of its individual members to do a day's work.

Impossible? Nothing of the sort. The support of the Rockefeller Foundation and many other individuals and organizations of individuals, if such support be necessary to the fulfilment of the purposes of the medical profession, would unquestionably be obtained much more quickly in support of some well-defined health program than otherwise. And there is every indication that cooperation in the accomplishment of any such undertaking which gives assurance of practicality and public weal would have been, is now, and most certainly will in future be more easily secured than finding some man or institution public spirited enough and with enough resources at his or its command to assume the entire burden and stand before the scientific and lay world in the shadow of the consequences inherent in the discharge of such an enormous job.

There is something in this situation beside the dramatic effect of a clash over fee fixing by an institution which was not conceived in the travails of the profession.

What is it? Just this: the question whether the medical profession is willing now for all time to concede that agencies outside the profession are better able to devise and administer a comprehensive public health program than the profession can devise and administer it. If it is willing to admit that, then there is but one conclusion possible: the only way in which any member of the medical profession can ever hope to attain a commanding position of eminence or public respect for worthy achievement is to find some patron saint with oodles of money who is willing to gamble on his ability with no possible hope of personal return.

It is submitted that sort of a condition is unworthy the medical profession. It is submitted that there is a larger sphere of usefulness for every man who by due preparation has earned the right to subscribe to the noble ideals and certain obligations of the medical profession. It is submitted that, in the coordinated activities of the profession as such for the achievement of some inclusive plan designed to build and conserve the public health, will be found ample opportunity for the full expression of the individual initiative and native ability of every member of the profession. It is submitted that in no other way can those members of the profession who love it for what it is, as well as for what it hopes to become, behold in the future the certain achievement of those things they cherish as life itself.

Unless the profession is willing to entrust the future fulfillment of those sacred vows which make it responsible for the life and death of men and women everywhere to some social unit without its control, it must realize immediately that it is not possible to meet the health requirements of more than a hundred millions of people engaged in highly organized industrial and commercial pursuits except by an equally rational and highly organized health program. The fact is, the present demand for a complete socialization of medicine is but the reflection of industrial organization. It is at bottom a demand that the medical profession as individuals bring to the welfare of their respective communities a national purpose, a national interest.

The burden of meeting this test cannot be shifted to the government by the medical profession unless it is willing to accept the other horn of the dilemma, or stated otherwise, unless it is willing to take such pay for its services as the government is willing to give. That is to say, those forces at work in the medical profession covertly and openly suggesting that the question of public health is one for governmental action on the

theory that the government as the representative of all the people should assess taxes to finance it, cannot escape the right of the people to say how many medical men they will have and what they will pay them for their services. To assert the one while denying the other is sheer nonsense.

The action of the Board of Trustees of Johns Hopkins is a case in point. That institution, operated as it is on a non-profit basis, cannot consistently permit surgeons and physicians practicing there to conduct their business on a profitable basis. It makes no difference now that the maximum fee for operation has been fixed at $1,000.00 and weekly attendance at $35.00. The precedent has been established and if it shall be found that those amounts are not correctly representative of the principle on which the institution is conducted, it will be easy to revise them downward to the point where, in the judgment of the Board of Trustees, they will represent it. They can do nothing else and remain true to their trust. It is simply the principle of benevolent autocracy pressing down on the medical profession as differentiated from the public generally, and as such it must run true to form or become a thing at which men will sneer for its empty pretensions. And the Rockefeller Foundation, because it is the creature of unexampled individual wealth in all the world, must lay down its course in strict conformity with that rule or forever close the door of public respect and professional confidence in its own face.

All which brings us to the crux of the problem: the medical man can no longer pursue a scientifically individualistic course: he must measure his conduct by those requirements imposed by all the medical profession collectively: and the medical profession as the composite representative of all the people for the preservation and betterment of the public health, must devise and enforce some plan which wil discipline medicine, which will create a permanent public record, and provide that high moral purpose whose mighty impetus will insure continuity of effort.

Precepts Applied

CONSTANT preaching without practice soon becomes odious. Precepts, however good, are valueless except as they are applied and made to fructify in conduct. If you happen to have more regard for deeds than words, the job of avoiding the stigma of preaching by accomplishing something in practice is a good deal like one of those hideous nightmares where you find yourself in a public place half dressed.

For these and many other reasons, The Journal undertakes to discharge that imperative duty which it has consistently asserted devolves on every person or organization of persons seriously interested in substantial affairs. So much has been said in this and previous issues about the importance of a deliberately constituted program that The Journal feels it would be open to criticism did it not make a specific statement regarding its own motivating causes. It will, therefore, endeavor to state with as much accuracy as possible those salient things it is striving to assist The Radiological Society of North America to achieve: and it will go further by saying that it will always endeavor to correctly respond to that inner urge which if pointed in the right direction will accomplish much of benefit for all those persons honorably and legitimately interested in the science of x-rays.

In passing, it hardly seems necessary to further delineate the ideals and purposes of The Radiological Society of North America. They have been stated too often to need repetition here. It is sufficient to say that The

Journal subscribes to them in all sincerity and will be governed by them.

The present effort will be confined to an attempt to give an accurate interpretation of the vision which The Journal holds concerning the ultimate posibilities incipient in the science of x-rays. And that it may profit by having constantly before it a perpetual reminder of its duties, it will endeavor to be so specific in this declaration that neither it nor those persons constituting the science will ever forget that at this particular moment they stand on the threshold of unlimited opportunity for extended scientific service, that they may, if they will, exercise the unparalleled privilege of going forward to the universal use of x-rays in diagnosis and treatment, or by remaining inert and self-sufficient, they can and will, slough off into a restricted sphere of activity through sheer failure to perceive the way of usefulness. In other wordls, the science of x-rays must prove itself a dynamic force in the health structure of the world, or pay the penalty which the public always exacts for a static existence.

All this applies to those physicists and electrical engineers interested in the development of the science of x-rays, as well as to the manufacturers and distributors of apparatus and equipment. Certainly their concern in the question of a broadened influence of the science as expressed by an expanding market because of the universal application of the benefits discovered and applied is just as vital and real as the same question is of paramount interest to the Radiological profession.

Believing that there exists a mutuality of interest which should beget the earnest cooperation of all parties identified with the science, no further discussion will be indulged in these general phases of the subject.

Wherefore, The Journal makes bold to say, predicating its statement on the most meticulous observance of all those conditions and requirements imposed by the ethics of the medical profession and the high professional and scientific standards of The Radiological Society of North America, that it believes it can, and should, serve a four-fold duty as an exponent of the science of Radiology. It holds to the view that it will not have justified its existence unless:

FIRST: It does everything in its power to subserve the public health by employing all proper means and instrumentalities at its disposal to familiarize the public at large with the known benefits and latent possibilities of the science of x-rays diagnostically and curatively.

SECOND: Unless it establishes and maintains intimate contact with as many members of the medical and dental profesions as possible, in order that they may correctly understand the aspirations and limitations of the science of Radiology.

THIRD: Unless it serves as a positive agency through which the best interests of the public may be properly portrayed and conserved, and the activities of the manufacturers of apparatus and appliances coordinated with the needs and ideals of the Radiological profession.

FOURTH: Unless it uses its influence in assisting all these forces to organize into a cohesive unit by disseminating known facts, by striving to point out at all times those developments which are posible through the projection of established principles, and by attempting to preserve that nicety of balance between the public, the profesion, and the manufacturers which will insure a happy combination of past worth with future purpose as a guaranty of present performance.

To be sure, these are enormous undertakings. But they are not larger than the opportunity the science enjoys. And since only in proportion

as its vision is comprehensive can a journal of this kind function fully, it is better to state the problem broadly, set the stakes high, and then proceed as far as the combined intelligence of all will carry.

Some of the machinery incident to the results indicated is detailed in the suggested activities for The Radiological Society found elsewhere in this issue. Much remains for the future. One phase of the subject is worthy special emphasis. Greater diligence must be accorded the acquaintance of the public and the profession with full details concerning the accomplishment of medical radiologists in the treatment of eczema, infected tonsils, cancer, venereal diseases, rheumatism, in diathermy, ionic medication, etc. The public health demands it; and if that information be tendered in a proper spirit of helpfulness, it cannot be refused. Nor will it be refused. The fact is, every reputable physician and surgeon worthy the name is always on the alert for assistance which will reflect itself in his patients' welfare.

The Journal believes that the primary object of the Radiological profesion is the universal application of the peculiar scientific knowledge that profession posseses and applies in alleviating human ills. Proceeding from this premise, two major propositions are immediately encountered:

1. The necessity for accurate classification of those ailments in which at present the use of x-rays is of known benefit, with a detailed statement of methods employed and results obtained in each: and likewise classification of those ailments in which exploratory research is in progress, with a detailed statement of accomplishments and failures in each.

2. The methods which can be used most sucessfully in getting this information into the hands of the medical profession at large in such a manner that it will be used in furthering the use of x-rays for the purpose of producing a better public health.

The classifications indicated in the first of these two items will serve to dispose of many mooted questions and will afford everybody a clearer conception of their opportunities and responsibilities, as by establishing a definite line of cleavage between those things which the science of x-rays can defend as accomplished facts, and those things toward the attainment of which it aspires.

The importance of the correct determination and use of the factors involved in the second item begins to strike a responsive chord when one is confronted with the fact that the prosperity or development of the professional and commercial subdivisions of x-ray science is of immediate concern to the general public and to the medical profession as differentiated from the Radiological profession. The public is intensely interested in the development of the science of medicine in all its branches because in that fact it sees the answer to a great economic problem. The medical profession on its part has assuredly expressed its extreme desire to employ all the collateral sciences in the performance of its work. And the manufacturer finds safer ground in a large volume of business at less profit on each transaction. Thus the circle is complete. The various factors are so interrelated that they are absolutely interdependent.

No serious argument can be interposed, therefore, against the proposition that the one big idea into which The Journal can coördinate all these various factors, is an increasing public and professional recognition of the practical usages of Radiology in the diagnosis and treatment of human ailments.

To the attainment of this end, The Journal will attempt to be constructive in its criticisms and suggestions at all times: it will hold that the public

welfare is paramount, and will measure its opinions and actions by that fact.

Dropping to the commonplace for a moment: attention is directed to the fact that among more than a hundred thousand physicians and surgeons in the United States will be found less than two thousand medical radiologists, meaning by the latter term graduates of reputable medical schools specializing in the practice of Radiology. The present population of the United States exceeds 100,000,000 of people, more than fifty per cent of whom are suffering from some disease according to the United States Surgeon General's statistics. This means that for every practicing medical radiologist there are more than 25,000 potential patients for diagnostic and curative application of x-rays. Of course, not all of these persons are suffering from ailments where x-rays would be beneficial diagnostically or curatively. But from the classifications made by the Surgeon General and the extensive use of x-rays by the medical corps of the U. S. Army, it is safe to assume that at least half of them would be benefited by the use of x-rays in one instance or the other, or both. Based on three hundred working days in the year, this would mean, if all those persons were receiving x-ray attention, that every medical radiologist would have more than forty new patients every day without counting those returning again and again for treatment purposes.

No sane man will contend, of course, that the medical radiologists of the country are enjoying any such fabulous practice. But the point is, there is a tremendous opportunity for the development of the science, first in its beneficial application, and second, in the kind of educational work which will bring the benefits of the science to the notice of all these people.

At the present time, approximately ninety-five per cent of those persons actually receiving x-ray examination and treatment do so at the suggestion of the attending physician. Only five per cent voluntarily go to an x-ray specialist or demand his services while under the care of a physician or surgeon. These observations are made because they indicate pretty clearly the hiatus which must be bridged before the broad functions of the science of x-rays will be certain of fulfilment.

The medical profession, and through it, the public, must be kept fully informed of the certain benefits and possible uses of x-rays. This statement is made with full cognizance of the fact that everybody knows there is such a thing as x-rays. The difficulty with the situation is that the public generally—indeed the same thing applies to many practicing physicians, surgeons and specialists—is not aware of the splendid results obtained by medical radiologists in genito-urinary disorders, gastro-intestinal disturbances, malignancies of one kind and another, and so on. The public has been told about the value of x-rays in the exploration of bony structures. But there it stops, because that is where its information stops. It has been fed up with a lot of wild hallucinations about the dangers of x-rays, but absolutely nothing contrariwise.

Certainly those persons concerned first-hand with the successful development of the science of x-rays should have faith enough in that science, should be enthusiastic enough about what it has accomplished in the brief period of its use, and what it bids fair to achieve in the immediate future, that they can without any loss of dignity or prestige, and without the violation of any of the ethics of the medical profession, stand foursquare before a world which is confessedly athirst for specific knowledge that will aid in the prevention and cure of disease.

Knowledge is power. And The Journal proposes to lend its support to the development of the science of x-rays in order that knowledge of the subject may be materially increased and the power of the medical profession in preserving the public health greatly enhanced.

With these things constituting its ultimate aim, The Journal will:

1. Endeavor to conform its every act with, and give unrestricted visualization to, the purposes, ideals, and standards of The Radiological Society of North America. In this it will include all other reputable organizations whose incontestible purpose is the progress of the science of x-rays and the technique and apparatus thereof.

2. By constructive and impartial discussion seek to command the certain recognition of and be wholesomely supported by the various specialties of the medical profession as well as the profession in toto. In this way The Journal hopes to stimulate the free interchange of accomplishments and desires between all branches of the profession so that the limitations of each and the peculiar benefits of all others will be instantly perceived, guarded against, and utilized without stint in every activity affecting private welfare or the public health.

3. Endeavor to demonstrate as practically as may be, all things considered, every major idea advanced either on behalf of the public, the profession, or manufacturers of apparatus.

4. Judge every condition sought to be corrected and every cause promoted by the test of its applicability to the diverse ramifications of the public welfare.

The Journal assumes to undertake such a comprehensive program because it is of the firm opinion that thereby:

1. It can be of greater usefulness to the public, The Radiological Society of North America, the Radiological and medical professions, and the manufacturers and distributors of x-ray apparatus and equipment, diagnostic and explorative instruments, and supplies of every kind designed to facilitate the determination of the correct situs and character of all manner of human ills.

2. It can engender much favorable editorial and news comment and bring to the science of radiology as a vigorous factor striving to conserve private and public welfare, champions whose hands will not be stayed by any misconception of public interest.

3. It can inculcate into the science of x-rays that happy combination of active public and professional participation in the attainment of a broad and exact sphere of usefulness which will bring unequivocal credit to it and to the medical profession as a whole.

The Journal appreciates that the working out of such an extensive program will require an enormous amount of study and call for lavish expenditure of energy and time. But it is perfectly willing to assume all the responsibilities devolving upon it as a comprehensive Journal of Radiology. Perhaps it may at times seem hopelessly involved in the maze of complications incident to the coordination of so many interests into a common plan. But it will never falter in its determination to bring to the public health a constantly increasing application of the beneficial properties of x-rays wisely administered.

DEPARTMENT OF TECHNIQUE

The Elbow

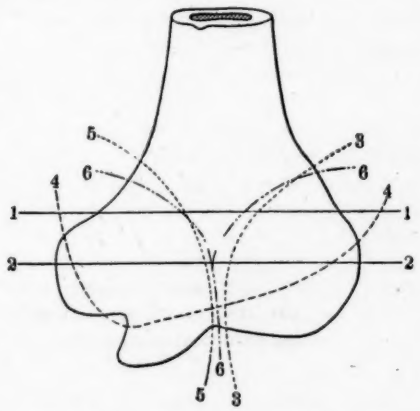
IT is always necessary to make plates in the antero-posterior and lateral planes or, if this is impossible, a set of stereoscopic plates will usually give the desired information. In fact, we find it helpful to make one plate in the antero-posterior plane and a pair of stereoscopic plates in the lateral plane as a routine. The latter are very helpful in determining the source of a piece of loose bone or in getting a good understanding of the relationship of the different articular surfaces.

One of the most difficult tasks set for the radiologist is to determine the presence or absence of a fracture of the lower end of the humerus in the young before ossification is complete. It is advisable for the radiologist to make plates of normal elbows of children at different ages up to the time of complete ossification and to mount these in a viewing box where they will serve as an atlas of normals for ready reference.

Another point which will serve the radiologist well is a good knowledge of the anatomy of the lower end of the humerus. The fact that all fractures of the lower end of the humerus (save that of the epicondyle) are inside the joint capsule makes them always serious and the outlook grave. We believe, however, that when the surgeon thoroughly understands the anatomy and pathology and mechanics of reduction, together with proper after-care, that the great majority of these fractures will result in good function. We feel that every radiologist and every surgeon dealing with fractures should master that most excellent monograph on Fractures of the Lower End of the Humerus, by Ashurst. Although this book has been published several years, it still stands without a peer in this field. The classification of fracture of the lower end of the humerus as given by Ashurst is as follows:

1. Supracondylar.
2. Diacondylar.
3. External condyle.
4 Separation of entire lower epiphysis.
5. Internal condyle.
6. Intercondylar, T. or Y.
7. Trochlea.
8. Epitrochlea.
9. Epicondyle.
10. Capitellum.

The classification is arranged in the order of their frequency, the first three comprising the great majority of all fractures.



After Ashurst—Lines showing position and direction of different types of fractures of lower end of humerus, the numbers corresponding to the types in the classification above.

The radiologist will be helped by the knowledge that the lower epiphysis of the humerus is horse-shoe shaped and that the first center of ossification to appear is the one for the internal condyle. In the normal elbow of the child this rounded bone shadow will stand distal to the shadow of the shaft on the ulnar aspect and slightly anterior to the shaft. Frequently, one is able to determine the presence of a fracture by the shifting of this center of ossification even though the line of fracture extending through the cartilagenous portion is not demonstrable. In no case is it more important to correlate the physical findings with the radiological findings than in fractures of the lower end of the humerus in the young.

The actual exposure technique used by us is as follows:

	KV	SG	Dis.	Ma.	—Time— Film	Plate
A.P.	50	5	26	30	1-1½ sec.	2-2½ sec.
Lat.	50	5	26	30	1-1½ sec.	2-2½ sec.

NEW EQUIPMENT

The Victor Deep Therapy Unit

FOR those contemplating the installation of new equipment either for the first time or in replacement, it should be gratifying to learn that the Victor X-Ray Corporation has combined the more important of its latest devices into what it is pleased to announce as a Deep Therapy Roentgen Apparatus.

Briefly, the outstanding component features of this new unit comprise:

1. High voltage transformer capable of producing and operating at 280,000 volts, or an equivalent of twenty inches spark gap. This transformer carries a "Snook" cross-arm rectifying switch.

2. A control stand on the panel of which are mounted the motor switch, x-ray switch, polarity indicator, volt meter, Coolidge Filament Control, and resistance control.

3. A deep therapy table, whose especial feature is a tube stand with a travel of 44 inches lengthwise, operating on four ball bearing wheels riding on tracks; a tube holder with a travel of 10½ inches across the table, and a 60 degree tube tilt, i. e., 30 degrees on each side of the vertical crosswise of the table; a 40 degree tube tilt, 20 degrees each side of the vertical lengthwise of the table. Calibrated scales in degrees cover all these tube tilts.

By means of a rack and pinion, the tube holder can be raised or lowered over a travel of 22 inches. With the tube in the lowest position, the distance from the center of the tube target to the table top is twenty inches; the maximum is 42 inches. The 8-inch lead glass bowl is mounted on a swivel providing complete rotation, a rack of filters is provided, and any of the positions obtained by the tube can be retained by lock-clamp.

4. Filament Transformer — practically the same as the standard Coolidge filament transformer used in connection with 10-inch spark gap. Provision has, however, been made for the additional voltage.

5. Victor Kearsley Stabilizer—It is suggested that the stabilizer forming a part of this unit be suspended from

the ceiling with two milliampere meters in series. The two meters, it is asserted, provide a double check on the milliamperage through the tube, one meter checking the other, and making certain of correct tube current.

6. Coronaless Overhead System—Special tubing has been designed for this outfit of three-quarter inch diameter, which when suspended 18 inches from the ceiling on insulators designed for 280,000 peak volts, will prevent corona.

7. New Coolidge Deep Therapy X-Ray Tube—Follows Coolidge Universal type of tube construction. It is built to operate at a voltage not exceeding 200,000 peak volts, at which it will stand a current of 8 milliamperes.

8. The Victor Sphere Gap—The only instrument of absolute precision for peak voltage measurement. This particular device was discussed at considerable length in the September issue of The Journal.

The Victor Corporation, at the time of announcing this unit, also brings out The Victor Bucky Diaphragm Table, the trough of which extends the entire length. The arc of the trough corresponds to the radius of the grid of the diaphragm, which is mounted directly underneath and traverses the entire length of the table on roller bearings. This movement is in unison with the tube stand to which it is locked. This table carries with it a false top so as to make it a piece of apparatus of universal utility and avoid the necessity of purchase of two tables. Another added feature is the fact that the Victor Compression and Immobilizing Device has been adapted to this table.

On the whole, this outfit represents all the latest Victor accomplishments in new apparatus and equipment, embodying all the well-established principles that have come up with the profession, and is a long forward step in the direction of duplication of dosage and standardization of technique.

Patterson Cleanable Intensifying Screen

THE first public exhibition and announcement of the new Patterson "Cleanable" Intensifying Screen was made at the annual meeting of The American Roentgen Ray Society in Washington, D. C., September 27th, 28th, 29th, and 30th.

This screen is a very real advance in screen manufacture. Of course, most radiologists and technicians appreciate that the chief cause of damage to intensifying screens is dirt, dust, and other foreign particles which in some manner become attached to the surface of the screen, becoming imbedded in the emulsion and thus preventing removal.

The Patterson "Cleanable" is impervious to dirt or dust which may work into the cassette or settle on the screen when lying open on the table. It also resists smearing materials like soot, crayon, lead pencil or aluminum marks.

The screen is also waterproof. Thus any dust or liquid spilled on the screen can be wiped off without damage. Developing solutions have no effect on the screen provided they are not permitted to dry down. These solutions carry a precipitate which leaves an indelible stain if permitted to dry down before removal. The cleansing of this screen should be with a piece of cotton cloth and soap and water. The screen should not be dipped into a bath or held under a spigot.

Patterson guarantees the same standard quality in this screen that has characterized Patterson products for years: it may be used as Standard or Special, and in either position in double screen technique.

Wappler Radiographic and Fluoroscopic Table

AS usual, Wappler Electric Company is on the market with something decidedly advantageous in a table for radiographic and fluoroscopic work. The table incorporates the well-known Wappler Counterbalanced, gravity operated plate changer; a trochoscope mounted on rails beneath the table and travelling its full length; a stereoscopic tubestand, also mounted on rails and travelling the full length of the table; and as a part of the tubestand a combination device for holding the fluorescent screen for fluoroscopy. This device has space for a 11x14 cassette, making possible radiography from the underside of the patient.

The table itself is largely of wood construction, beautifully finished in mahogany.

ABSTRACTS AND REVIEWS

Stereoscopical Roentgenoscopy and a New Apparatus for its Application. J. Van Ebbenhorst Tengbergen, "Archives of Radiology and Electrotherapy," No. 252, Vol. 26, July, 1921.

CONSIDERING the marked advantage of stereo Roentgenoscopy, the author expresses his wonder that it is not in more common use, and states that he knows only one radiologist using this method of stereo fluoroscopy. He goes into the principle underlying this procedure and then describes his device, which consists essentially of a single stereoscopic tube, or twin Coolidge tubes, wired in opposite directions in the secondary circuit and this can be operated with or without a rectifying device. The lead is taken off to operate the dual electromagnets of his instrument, which he has designated as a "SYNCHRONOSCOPE." This instrument works in a similar way to the ordinary kinematograph shutter by a revolving shutter with its blades running in synchronism with the appearance of the fluoroscopic image from the twin tubes in such a way that the left eye is covered while the left tube is excited, and when the right tube is excited the shutter has turned sufficiently so that the left eye is free to visualize the screen image, while the vision of the right eye at this instant is blocked. In this way the rapid alternation produces a pseudo stereoscopic effect which aids materially in visualizing the object being examined.

He has extended his experiments to apply the method to the projection "x" by using duplicate plates thrown on the screen by two lanterns with the aid of the synchronoscope, but in order to visualize it properly each observer must be provided with an other synchronoscope.

NOTE:—This instrument appears essentially the same as that described by Doctor Eugene Caldwell in the "American Journal of Roentgenology," page 547, No. 12, Vol. 5.

x—Of the stereoscopic image on the screen.

L. K. POYNTZ.

Intestinal Radiography for Chronic Appendicitis. L. Erasmus Ellis, M. D., "Archives of Radiology and Electrotherapy," No. 252, Vol. 26, July, 1921.

THIS paper begins with favorable comment on the advance made in abdominal diagnosis by aid of Roentgenography during the past few years. He describes the technique used in his examinations, which consists of the administration of 20 to 25 ounces of an opaque milk meal, the patient in the standing position behind a Fluoroscopic screen. Deglutation is watched and a recording plate is made of the stomach at once, and at intervals varying according to the particular indications of the case, (but chiefly one, three, seven, twenty-four, forty-eight and seventy-two hours after ingesting the meal) additional plates are made, supplemented by further fluoroscopic examination.

As a result of his experience he now concludes that "chronic appendicitis is no longer merely a name, but an actual entity with such a constant analogy of signs as to constitute almost a classical picture. These he enumerates to include : (a) reflex erratic spasm of the stomach with a delayed emptying time; (b) a Lane's kink which he claims nearly always exists; (c) appendix may be shown apparently adherent to the terminal ileum; (d) he regards the kinking, clubbing, or segmentation of the barium contents as pathological—this latter condition he describes as "sectional." (e) the non-filling of the appendix is often significant of a chronic inflammation which has resulted in an obliterating sclerosis; (f) delay in the terminal ileum with a hypertrophy or dilation of this gut is frequent; (g) drawing down with a resultant kinking of the hepatic end of the transverse colon into the right iliac fossa he considers as a constant sign. Any or all of these signs may be present in a single case and often give the clue to the Clinician of the cause of the vague clinical symptoms or complaints of gastro - pyloro - duodenal - dyspepsia, where no suspicion of the appendix

appears from clinical examination.

Eight cases are then cited illustrated by a similar number of radiographs. The case histories, the roentgen findings are briefly gone into and the surgical findings checked. He is very honest in admitting his errors and he reiterates what he considers the "four cardinal signs", which he designates as the "syndrome":

1. Delay in the progress of the meal in the ileo-caecal region.
2. A Lane's kink.
3. Controlling pathological appendix.
4. A kink in the proximal portion of the transverse colon.

L. K. POYNTZ.

A Case of Large Penetrating Ulcer of the Lesser Curvature. F. Herman-Johnson, M. D., -'Archives of Radiology and Electrotherapy," No. 252, Vol. 26, No. 2, July, 1921.

THE writer cites the case of a patient, 60 years of age, whose clinical history and Roentgen findings show conclusively a large penetrating ulcer of the lesser curvature of the stomach. Operation was refused, so medical treatment, consisting chiefly of rest and milk diet, was instituted with a complete amelioration of the symptoms. An interval of several months of ease followed this. There was a gradual reappearance of the symptoms and eighteen months from the date of the first Roentgen examination he was re-examined by this method and an attempt was made to duplicate the conditions under which the original plate was made. This showed a perfect silhouette of a normal stomach. However, another view from a different angle showed that there was still some excavation at the site of the original ulcer.

The writer points out the total inadequacy of a single plate for gastro-intestinal diagnosis and calls attention to the apparent healing, though only temporary, of this large ulcer cavity, under medical treatment alone.

The article is illustrated by three excellent plates.

L. K. POYNTZ.

Research and Radio-Therapeutics. As Reported in "Archives of Radiology and Electrotherapy," No. 252, Vol. 26, No. 2, July, 1921.

IN view of the rather brilliant results that have been claimed by Professors Seitz and Wintz of Erlangen, in Bavaria, there has been appointed a committee consisting of Sir William Milligan, Professor H. R. Dean, Professor W. L. Bragg, Dr. Powell White, James Watts, Esq.; Dr. A. Burrows, and Dr. A. E. Barclay for the investigating of their methods and claims. The sum of £4,000 has been donated and set aside to defray the expenses incurred in this investigation and the manner suggested to accomplish this end is the appointment of a scholar for a period of two years who shall visit the Clinic at Erlangen, Frieburg, Berlin, Mannheim, and other centres in France, Holland, and Sweden, as are considered desirable. This scholar is to furnish a preliminary report of his visit to Erlangen and if this report is favorable a complete equipment is to be purchased and sent to the Manchester Royal Infirmary to carry on the investigation there. This will be done by the scholar on his return from the Continent and there will be placed at his disposal the complete facilities of the hospital, consisting of three other equipments. The sum of £350 per annum will be offered as salary with an additional £50 as travelling allowance. Because of the amount of work undertaken the announcement states that it is probable that assistance and collaboration from others will be required.

NOTE:—This announcement is being abstracted because it is a rather significant step being taken by the British school to find out the real truth about the intensive x-ray treatment of cancer as practiced in Germany and I believe will be of interest to the radiologists of this country.

L. K. POYNTZ.

Clinical Features as the Determining Factors in the Application of Radium and Roentgen Rays in Malignancy. Dr. Paul Eisen, Detroit. Jour. Michigan State Medical Society, February 3, 1921.

THE physical and biological aspects in the treatment of malignancy usually crowd out the clinical considerations. The most important clinical feature to consider is to determine if the tumor is localized or metastatic. Even if the latter, it may need treatment. Operability and prognosis enter in.

The second clinical feature of importance is to determine how rapidly the tumor is growing. Any part of the body may be treated by roentgen

ray. The resistance of the patient to malignancy is the all-important question. Patients react differently.

A third clinical factor to determine is the origin of the tumor. Cancers of the bladder, the tongue and vulva, and some periosteal cancers and chondrosarcomata yield very poorly.

The greater the age of the patient, the greater the resistance. Malignancy in the young travels fast. The longer a patient has a cancer, the easier it is to attack it. Cachexia is a disastrous feature. The intervals between treatments depend on the patient's tolerance. Surgery must go hand in hand with roentgen ray and radium—their use must be complementary. Infections increase the rapidity of spread and lessen the chances of recovery. If pain does not disappear under treatment the prognosis is bad. Hemorrhage generally ceases. The blood supply must be conserved. Organs with a large blood supply, such as the thyroid, must be treated carefully. The blood and urine must be under constant control where heavy dosage is applied. It is suggested that tumors generally produce immunity in the body.

A resultant scar in malignancy is a clinical manifestation that the lesion is healed. Contradiction of the whole area is a good sign.

These remarks apply to localized malignancy only. The clinical features determining the method of raying generalized malignancy are different.

E. W. R.

Symposium on Uterine Cancer and Irradiation. Drs. Rex Duncan, Los Angeles; Henry Schmitz, Chicago; John G. Clark and Floyd E. Keene, Philadelphia. Jour. A. M. A., August 20, 1921; pp. 604-620.

THESE three papers were read before the section on Obstetrics, Gynecology and Abdominal Surgery at the seventy-second annual session of the Amedican Medical Association. They cover nearly every phase of the subject. The high standing of the authors, whose opportunities for handling a large number of cases assure them a careful hearing, demonstrates the importance of radium in carcinoma of the uterus. One is chosen from the west, one from the middle west, and two together present a paper from the east. This gives them a wide range of experience.

In each paper careful attention is paid to the history of radiation treatment, to the physical aspects, to the pathologic changes, to the technique and to the results. The conclusions are brief and are as follows:

Dr. Duncan:

1. Uterine cancer, when given early and appropriate treatment, is curable in a large percentage of cases.

2. Curative treatment depends on early diagnosis. It is necessary, therefore, to extend public knowledge so that women will consult the physician early.

3. The profession must be more keen in the early recognition of uterine cancer, and greater attention should be given to the removal of chronic irritation and the extirpation of precan cerous lesions.

4. Appropriate radium therapy in recurrent and inoperable carcinoma surpasses any known therapeutic agent. Pain, hemorrhage and odorous discharges are relieved, and there frequently occurs prompt improvement in the general condition of the patient. Life is prolonged, and there results a comparatively high percentage of clinical cures.

5. Radium therapy, when employed by one with adequate facilities, skill and experience, is the treatment of choice in early, or so-called operable, carcinoma of the cervix. It avoids operation with the attendant suffering, invalidism, complications, and high immediate mortality. Symptoms are promptly relieved, and there results a higher percentage of cures than from surgery or any other method of treatment.

6. The efficacy of radium therapy depends on an adequate quantity of radium or radium emanation and appropriate facilities, together with sufficient knowledge and experience for its proper application. Proper dosage and technique are of the utmost importance.

Dr. Schmitz:

1. Prophylaxis plays an important factor in the treatment of cancer.

2. Classification of uterine carcinomas is of paramount importance to separate localized from the more advanced cases.

3. Localized carcinomas must be treated by surgical methods, preferably with the use of the actual cautery, while the borderline and advanced cases should be referred to ray therapy.

4. A combination of surgery with radiotherapy is not advisable. However, a combination treatment of gamma and roentgen rays assures better results than the application of either agent alone. The radium must be inserted into the cervical canal, while the roentgen rays are applied through the suprapubic and sacral regions. This also renders the treatment available for all classes of patients, owing to the lessened expense.

5. It is hoped that with an improvement in the technique, permanent recoveries will become more numerous.

Drs. Clark and Keene:

1. Radium in 100 mg. amounts will yield most gratifying results if properly applied.

2. To pursue a set course without variation in the frequency of treatments regardless of the progress of the healing is hazardous.

3. To attain the best results, the first irradiation should be done under nitrous oxid anesthesia, as a more careful examination may be made, and the radium more advantageously brought in contact with the malignant areas either through radium tubes or by radium needles. Gauze packing instead of metal shields should be used for protective purposes.

4. The process of cure passes through three stages: local destruction, connective tissue formation, and hyalinization.

5. A hysterectomy after successful irradiation of an otherwise inoperable case is hazardous and does not promote the best interests of the patient.

6. Results of irradiation in cancer of the cervix practically remove this class of cases from the surgical field, although we have not yet completely yielded this point.

7. Cases of cancer of the fundus, unless too far advanced, or unless there is a critical surgical contraindication, should be submitted to hysterectomy, followed from fourteen to twenty-one days later by a light irradiation of the vaginal fornix.

8. Irradiation is dangerous immediately before or soon after an operation, or when employed in fresh operative fields.

9. Frequent repetitions of irradiation are probably unnecessary and possibly hazardous, as the foregoing observations point to the fact that the chief blow is struck at the first application.

10. The frequency of irradiation fistulas may be reduced to a minimum or almost completely avoided by the application of a well placed vaginal pack which removes the healthy tissues from the zone of intensive emanations.

ABSTRACTS OF DISCUSSION

Dr. William P. Graves, Boston: The propaganda for general education goes on. The good that radium has done is witness to this fact. If radium never cured a case the wonderful good accomplished by palliation has been a boon to humanity. Rarely can a patient not be helped. Operability depends on whether the patient can be cured by operation. Results around Boston do not warrant condemnation of the operation to cure cervical cancer.

Dr. Ochsner, Chicago: For years the cautery in carcinoma of the cervix had been used in the Ochsner clinic. During the last four years the number of operations has been reduced. In the last year none have been operated upon and all have had radium. A section for pathologic examination is not advisable because of the danger of metastasis. Radium can be introduced under spinal anesthesia without any discomfort to the patient.

Dr. Taussiz, St. Louis: There is no routine radium treatment for cancer of the cervix. Every case has to be handled differently, with different amounts of radium, of filtration, and different dosage. Morphine-scopolamin anesthesia is useful in applying the radium and the packing. This should always be done in the knee-chest position.

Dr. Schmitz, Chicago: Radium can be effective for only 3 cm. in any direction. For reasons of this limitation roentgen ray irradiation is combined with it. Every patient should be treated the same, by one standard method. The disease and not the patient should be treated.

Dr. Keene, Philadelphia: Treatment should not be by rule of thumb, but by adaptation of method to the patient. Local anesthesia is useful. Emanation needles in the broad ligaments have never resulted in harm in our hands.

Dr. Duncan, Los Angeles: Even if there are no cures, the palliation is superior to any other method. Cervical carcinoma is not surgical and should be treated with radium.

E. W. R.

Radium in Carcinoma of the Uterus. William Kohlman, New Orleans. Surgery, Gynecology and Obstetrics, August, p. 159.

THE use of radium began as a palliative in malignancy. The results obtained have made a place for it in treatment as an adjunct to surgery, and often rivaling and even exceeding it in results obtained. The low operability, the high operative mortality and the low percentage of cures of surgical treatment give encouragement to any method which promises better results. The palliative and curative results of radium have been surprising.

In inoperable carcinoma the treatment of radium is the method of choice. Preoperative radium treatment is advantageous, but it should be followed by early operation. Late operation following radium treatment is difficult. Post-operative treatment is the routine. Post-operative radiation by the roentgen ray may be used instead of radium.

On the question of the use of radium in early operable cancer of the uterus there is a division of opinion. Such cases treated by radium, because some complication contraindicated operation, have done surprisingly well. Surgery could not have done better. Less frequent local recurrence was observed.

Claims for the great value of radium must not be over-emphasized. Cures can only be expected in early cases.

Radium radiation is considered effective at a distance of from 3 to 5 centimeters. Combined radium and roentgen radiation should increase the value of treatment. Within three to four days there are apparent decided evidences of the effect of the radiation. The tumor lessens in size, due to destruction of the cancer cells and the slow formation of connective tissue. In order to lessen the blood supply the internal iliac and ovarian arteries are ligated as early as possible. Of twelve cases treated in this way, six are clinically for periods ranging from three months to one year and eight months. Some of these were advanced cases.

Since June, 1915, 96 cases have been treated in the Touro infirmary by the author, 56 by radium alone. Improvement was obtained in practically all. Recurrence or failure to respond promptly were considered ill omens. Most of the cases were advanced and inoperable.

SUMMARY OF RESULTS

Group 1. Carcinomata which are early and easily operable: (a) Cases treated with radium only. (b) Cases with panhysterectomy and post-operative radiation.

Group 2. Carcinomata that are doubtful and inoperable. (a) Cases treated with radium. (b) Cases treated with ligation and radium.

Group 3. Recurrence of carcinomata after panhysterectomy.

	Living	Dead	No Report	Tot.
Group 1				
(a)	4	1	1	6
(b)	5	4	0	9
Group 2				
(a)	22	22	12	56
(b)	7	5	0	12
Group 3	4	4	5	13
				96

The technique is simple. Silver tubes and 25-50 mgm. of radium in a 3 mm. brass filter and a finger cot are packed with gauze in the cancer crater. The packing is arranged to protect the bladder and rectum. Later the cervix is treated. In most cases the periods of treatment were eight to ten days apart. Examination was made from every four to six weeks. The rule is followed to treat every three months all cases that are clinically improving.

E. W. R.

X-Ray After Inflation of Pelvic Cavity. Dr. Reuben Peterson, Ann Arbor, Michigan. Surg. Gyn. and Obs., August, 1921, p. 154.

THIS is not a new procedure, but it has not been generally adopted as an aid to pelvic diagnosis. There was early prejudice against the method because it was supposed that little additional information could be detected, and for fear of the dangers. Bimanual examination aids in the diagnosis of inflammatory pelvic lesions, but it does not go far enough. Long experience made the author rather sure that he could tell all there was to tell after a bimanual examination, but he does not think so now. To one who is honest with himself and knows he makes mistakes, this method will be helpful and lessen the number of errors. Exploratory operations are fewer. More exact diagnoses are made.

Over 150 cases have been injected without any injury to the patient. This agrees with Rubin and Stein and Stewart. Such evidence is more valuable than any theoretical considerations.

Discomfort is common, and dependent almost entirely on the amount of gas inflated. As little as possible should be used. From 600 c.c. to 1,000 c.c. is sufficient. Inflammatory lesions increase the discomfort. Discomfort can be largely controlled by the slow introduction of the gas.

Carbon dioxide gas has supplanted the use of oxygen because of its rapid absorption, hence the brief period of discomfort. In 15 or 20 minutes the patient is comfortable. The rapid absorption does not prevent good work if the technique runs smoothly.

Transuterine gas inflation: The gas is passed with the patient in the Sims position. A uterine cannula is introduced after iodine sterilization of the cervix. The gas is introduced with no more than 200 mm. pressure. If gas passes freely, 500 to 1,000 c.c. are allowed to enter. The plate is then taken as if the inflation were through the abdominal wall.

Transperitoneal gas inflation: Most cases are handled by this method. The Rubin technique is employed for guaging the gas. Patient is in moderate knee-chest position, changing to Trendelenburg. The plates are then made in the usual manner.

SUMMARY

1. The uterus, together with tubes and ovaries, can be clearly shown by pneumoperitoneal roentgenography.

2. The tubes are more easily shown following the inflation by the transuterine route.

3. On account of rapid absorption, CO_2 would better be used.

4. Irregularities of the uterus, omental and bowel adhesions are clearly demonstrated.

5. By this method, diseased appendages may be more easily and accurately diagnosed.

6. The use of the knee-chest and Trendelenburg positions requires less gas, hence less discomfort.

7. If technique is good, retention of bowel loops in the pelvis is a proof of adhesions.

8. The pneumoperitoneal x-ray makes earlier diagnosis of pregnancy possible. The transperitoneal route is always used. (See discussion).

9. Both methods are free from danger.

10. Bimanual pelvic examination and pelvic pneumoperitoneal roentgenography are not antagonistic diagnostic methods. Each is valuable, and the value of either is enhanced when used conjointly.

The Treatment of Carcinoma of the Cervix and Uterus by Radium Supplemented by Deep Roentgen Therapy. Dr. R. H. Boggs, Pottsbury, Pa.

SURGERY has made no progress in the treatment of carcinoma of the cervix and uterus in twenty years. Refinement in technique has reduced the operative mortality but it has not lessened the ultimate results. Radiology and cautery have effected the only advancement. Carcinoma of the cervix is still a surgical disease, but cooperation between the surgeon and radiologist is necessary to obtain the best results. The radiologist must have sufficient radium and considerable experience to do the best that can be done. Too much work is being done poorly. Many methods of procedure are being followed out. Radiation is being given in so many ways that it is hard to draw conclusions.

Instead of hopeless cases, borderline and favorable cases are coming for radium treatment. Removing the local lesion is not so important as destroying the lymphatic invasion.

Radium destroys disease at a greater distance than the knife can reach. The pelvic glands should be rayed in all cases. The extent cannot be told by the size of the primary lesion. If 7 or 8 per cent of the cases coming for treatment of carcinoma of the cervix are free from disease in five years, then at least 90 per cent should have the benefit of radium.

When radium is used as an acute operative procedure, the operation should be performed within from four to eight weeks before fibrous formation has taken place. Observers report that 30 to 60 per cent show parametrial involvement at the time of operation.

Probably the only cures following the Wertheim operation are those in which there was no glandular involvement. Proper radium treatment locally, supplemented by deep roentgen therapy, would have given more cures.

On account of the rapid spread of the cervix and the hopeless condition

so soon reached makes any amount of palliation from radium treatment mean much to the patient. Today radium is indicated as a palliative measure for hopeless inoperable and recurrent cases, as an antioperative procedure, and for prophylaxis after surgical removal. Lately radium is being used for some primary cases in carcinoma of the cervix when the disease extends into the cervical canal. The malignant process should be treated by radium promptly.

Radium will clinically cure many cases. It is a specific palliative. If recurrence takes place the patient suffers infinitely less. The hemorrhage and discharge ceases. In two to four weeks the local condition improves and clears up. The deodorizing and disinfectant work of radium is remarkable.

From 3,000 to 6,000 mg. hours of radium, filtered by 1½ mm. of brass and sufficient gauze and rubber to make 15 mm. of filtration, are usually employed in the cervix and vagina. Three tubes are usually introduced, one in the cervix and one pointing toward each broad ligament. Due precaution to prevent injury of the bladder and rectum is taken.

At present there are several methods of applying filtered roentgen rays to the deep lymphatics. They are all producing about the same results if the technical points are known and sufficient lethal doses applied.

E. W. R.

X-Ray Treatment of Basedow's Disease. Dr. I. S. Trostler, Chicago. The American Physician, April, 1921, p. 289.

THE thyroid is the balance-wheel of metabolism. When normal, it influences oxidation so that no function is disturbed. When over-active, it causes the well-known symptoms of Basedow's disease. The main problem now is: What is the best means of slowing down these over-active, overworked glands?

Drugs may be administered, but the patient will not get well. Surgery cures but one-half of the cases operated upon, and many cases are too poor risks for operation. Crile now advocates non-surgical treatment. Surgery has an operative mortality of 3 to 6 per cent. It requires eighteen months to effect a cure. Fully 90 per cent of all cases are cured by x-ray therapy.

REASONS FOR X-RAY THERAPY

1. There is no harm, and past results show that many have been cured.
2. There is no operative risk.
3. There is no fear of operation.
4. There is greater likelihood of cure and less likelihood of recurrence.
5. There is likelihood of earlier cure, and shorter period of disability.
6. There is no scar on the neck.

The effects on the gland are simple. There is lessening of the activity of the gland by an obliterating enderarteritis of the blood vessels. It is as sure as ligation without the risk. Besides, there is a sedative action on the gland cells themselves. Treatments are continued until the action of the gland is normal.

Da Costa and the Mayos advocate roentgenization before operation in order to lessen the activity of the gland.

Four to eight full-dose treatments are necessary to effect a cure. A full dose may be given every 21 days except in the most toxic cases.

Because of the failure to secure cures in a small number of cases, it is necessary to treat the thymus area.

Of course damage to the heart or other organs which has already occurred cannot be remedied. But the damage will stop where it is and the repair will be surprising. In a few treatments all the symptoms improve. Even the exopthalmos, the last to improve, usually disappears entirely.

The treatment cannot be given except by an experienced physician.

E. W. R.

Roentgen Therapy in the Treatment of Carcinoma of the Breast. Dr. H. M. Stewart, Johnstown, Pa. Pennsylvania Journal of Roentgenology, July, 1921.

IMPROVED apparatus has increased the efficiency of roentgenotherapy. Good results require special attention to the therapeutic side of roentgenology. "Early diagnosis, early radical removal of the infected field by the roentgen method" was advocated by Dr. Leonard twenty years ago.

Four out of five cases operated before glandular involvement get well. When axillary glands are involved, the ratio is reversed. When supraclavicular glands are involved they usually consider the case inoperable. According to Pfahler, Boggs, Todd and Deane, 25 to 50 per cent more are cured by thorough pre- and post-operative roentgen therapy.

Mayo speaks of the importance of the lethal dose sickening the malignant cells and forming fibrous tissue and a barrier to the spread of the disease.

The mammary gland has more lymphatics than any other part of the body. X-ray causes an atrophy and partial obliteration of the lymph channels, as well as destruction of the cancer cells.

Medullary carcinoma usually responds more rapidly to radiation than the scirrhous type, but it grows more rapidly and demands earlier effective treatment. The health of the patient must be guarded as well as roentgen rays administered.

Prior to the course of treatment the chest should be examined for metastasis. Massive doses such as the Germans advocate are not feasible. Treatment consists of raying the entire torso, including the supraclavicular areas and the liver. Areas 2½ by 3 inches are advocated. Each area receives a massive dose. Fixed factors employed are the 9-inch gap, 5 to 10 mm. aliminum filter, 8-inch distance, and 18 to 20 minutes. With larger areas, greater distance is being tried on some cases.

This much is given preliminary to operation. In two weeks operation is performed. Post-operative treatment is begun as the patient is out of bed. Three series are given after the operation, each a month apart. No further treatment is given except in the very malignant types. The present tendency toward heavier filters and higher voltage is being experimented with.

E. W. R.

X-Ray Treatment of Tuberculous Lymphadenitis. Dr. I. S. Trostler, Chicago. The American Physician, August, 1921, p. 617.

SINCE 1903 the roentgen treatment of tuberculous lymphadenitis has grown in importance until it is now recognized as one of the best methods of treatment. The advantages are:

There is no fear of operation.
There is no anesthetic given.
There is no hospital expense.
There is no operative scar.
There is no confinement.
There is no pain connected with the treatment.
There is less likelihood of extension or recurrence.

The only argument against the treatment is the time element, which varies from five weeks to five months.

Brilliant results are obtained in early cases, especially the young, approximating 80 per cent cures. Sinuses close up earlier under treatment, though broken-down glands may need drainage. Aspiration is usually sufficient. Suppuration is not a contra-indication. It is advisable to swab out suppurating sinuses weekly with equal parts of phenol and tincture of iodine.

Tuberculous glands anywhere in the body are benefited by the treatment. Pulmonary tuberculosis is helped by the action on the lymphatic tissue of the mediastinum and hila.

Dosage varies, but a full dose once in 21 days is advisable, given as the experience of the operator dictates. Technicians should not give the treatment. Only trained experts in roentgenology should attempt the care of these cases.

E. W. R.

An Analysis of 200 Gynecological Cases Treated With Radium at the Women's Hospital in the State of New York. Dr. E. W. Titus. Am. J. Obst. & Gynec., 1921, p. 685.

TWO hundred and one patients have been treated in a period of eighteen months, with results the same as other workers.

Ninety-five cases were carcinoma of the uterus. In 86 the cervix was affected; in nine it was the fundus. Fifty-five of the first class are living and free from symptoms. Duration of treatment ran from six to eighteen months. Thirty-one patients died. Sixteen died in less than six months after radiation. Death was from metastasis in the lungs in two. Pneumonia took one.

In 64 the pain was relieved. It was increased in but few. Hemorrhage and leucorrhoea ceased in all but two cases.

Bladder symptoms anad rectal irritation developed in only a few cases. Fistulae in bowel or bladder arose in two patients.

Seven patients with advanced carcinoma are alive and well after eighteen months. All except two of the patients with cancer of the fundus are well. Four of them had a hysterectomy. Of five patients with carcinoma of the vagina, two are living. Involvement of the vulva has been

treated twice. One was too advanced for treatment; the other has been treated recently.

Carnicoma of the urethra and bladder were unsatisfactory.

In carcinoma of the rectum the results were good. Four patients are living; three over one year.

Non-malignant conditions: There were 44 cases of uterine myoma. In all the hemorrhage was controlled and the tumor reduced in size. In two cases the tumor disappeared. Thirty-nine cases of menorrhagia and metrorrhagia were in patients under forty years old. Hemorrhage was controlled in all but three cases.

It was considered safe to the menstrual function to use 600 milligram hours' application. Menses usually return to normal after two or three months. More than that may cause complete amenorrhoea.

Leucorrhoea ceased in all cases. Large doses of radium caused severe menopause symptoms in quite a number. Eight cases of severe hemorrhage at the menopause were treated successfully by 1,200 to 1,800 milligram hours.

E. W. R.

The Treatment of Epithelioma With Radium. Dr. Viola Zoe Allison, Pittsburgh, Pa. Jr. of Roentgenology, July, 1921.

NON-IRRITATING methods which destroy epithelioma are the methods of choice. The prognosis depends on the extent of involvement but not the size of the growth. Epitheliomas divide into the squamous-cell and basal-cell types. Rodent ulcer is the most common of basal-cell types.

These new growths may be classified according to results obtained, as follows:

1. Premalignant lesions, warts, moles, excrescences, and open irritation or abrasion such as a cracked lip or cold sore which exists more than three months. These require only a small amount of radium to effect a permanent cure.

2. Small localized lesions definitely malignant. One application of radium is sufficient.

3. Extensive superficial lesions without glandular involvement. If bone or cartilage are involved, the prognosis should be guarded. Large doses of radium will be required and will cure more than surgery.

4. Epitheliomata with glandular involvement. Radium with roentgen therapy gives the best results. Many are cured, but palliation only for the others.

Carcinoma of the cervix requires no more than the lower lip. The lower-lip cancers come early and metastasize early. Epithelioma of the tongue, floor of the mouth, buccal mucous membrane and tonsil are less hopeful because of rapid metastasis. Tonsil growths yield readily before metastasis, but the spread is rapid. Tongue tumors are bad because the muscle is resistant and the glands are early invaded.

"Radium will cure a larger percentage of epitheliomas with the least possible destruction of tissue, leaving practically no scar or deformity, with fewer chances of a recurrence, than any other method."

E. W. R.

The Practical Medicine Series, 1921. General Editor, Dr. Charles L. Mix; also Dr. Frank Billings, Dr. Burrell O. Raulston.

THE object of this book is to state briefly that which is important in the year's progress in medicine and surgery. Reference is made to the roentgen ray as a diagnostic measure in gastric ulcer, pleuro-pulmonary tuberculosis, the gastro-intestinal tract, and in arthritis. Its effects are studied under articles on metabolism in cancer patients, in tuberculosis and exophthalmic goiter.

The article on the "Results of Treatment of Exophthalmic Goiter by Surgical and X-Ray Methods" is by George H. Bingham and G. E. Richards of the Toronto General Hospital. Three hundred patients with goiter were studied. Theoretically—that is, reasoning from conclusions based upon the study of the histology and pathology of the thyroid gland and properties of the x-ray, the influence upon the different types is about in the following order:

1. The hyperplasias should be influenced most.

2. The adenomas should not respond as well.

3. The cystic type should not respond at all.

It is found that the results obtained are in accordance with this selection of cases.

It is possible, though difficult, to produce myxedema.

Simple goiters yield the best. One hundred per cent are cured if properly selected. Pure adenomas and cystic goiters are entirely surgical. Toxic goiters should be treated first with x-ray, and if this fails, surgery may be tried. Very few fail to show improvement. The hyperplastic type is looked upon as the ordinary exophthalmic type of goiter. The thyrotoxic type, with chiefly cardiac symptoms and occasionally an exaggerated nervous element, has been frequent.

Of 300 patients treated, 76 per cent showed some improvement, while 5.3 per cent failed to improve. The remainder could not be accurately classified.

It is not a question of x-ray versus surgery. It is the interest of the patient that must be watched. If intoxication can be reduced, whatever means is safe and sure should be employed.

Two objections have been raised. One is the length of time required. This is only a real objection in the mild cases which may be operated on. In severe cases it is dangerous to operate. Rest is demanded. X-ray can be given at the same time and surgery deferred or dispensed with.

The second objection is the production of adhesions and an increased blood supply. Opinions differ on this question. Whenever a patient is operated who has been treated by x-ray, any difficulty arising is blamed on the x-ray.

E. W. ROWE.